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CONTENTS FOR APRIL 1956 *Vol. VIII, No 2*

		Page
How Research Results Can Be Used To Analyze Alternative Governmental Policies	*Richard J. Foote and Hyman Weingarten*	33
The Farmer's Share: Three Measurements	*Kenneth E. Ogren*	43
Per Capita Income by Economic Class of Farm, 1949	*Ernest W. Grove*	51
An Appraisal of Interview Procedures in Farm Surveys	*Raymond E. Vickery*	59
Book Reviews	*Bushrod W. Allin, Harry Alpert, Eugene V. Prostov, James R. Anderson, and Richard J. Foote*	66

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AGRICULTURAL ECONOMICS RESEARCH

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How Research Results Can Be Used To Analyze Alternative Governmental Policies

By Richard J. Foote and Hyman Weingarten

Since 1952, several technical bulletins[1] *that deal with the demand and price structure for grains have been published by the United States Department of Agriculture. Research results from three of these bulletins can be used in an integrated way to consider possible effects of alternative governmental price-support policies for wheat and corn. This article discusses the ways in which such analyses can be made, with emphasis on the effects of alternative assumptions on the conclusions reached. It demonstrates the power of the modern structural approach for studies of this sort. Results obtained and conclusions reached in this article come directly from the application of certain systems of economic relationships based on specified assumptions. Although it is believed that these results and conclusions throw light on the alternative policies analyzed, they in no sense represent official findings of the United States Department of Agriculture. They are presented primarily to illustrate the kinds of analyses that can be made from an approach of this sort.*

TWO SETS of statistical analyses are basic for the studies reported in this article, and these are supplemented by certain other analyses. The first set of analyses is an equation that shows the effect of certain factors on the price of corn from November through May, when marketings are heaviest. The other set is a system of 6 equations that shows the simultaneous effect of 14 given variables on domestic and world prices for wheat and on domestic utilization for food, feed, export, and storage of wheat for the July to June marketing year. The supplemental analyses include studies of (1) normal seasonal variation in prices and (2) relationships among prices at local and specified terminal markets. These are mentioned in later sections.

The analysis for corn is described in detail on pages 5 to 12 of Technical Bulletin 1070. It was based on data for the years 1921–42 and 1946–50. The following variables were used:

X_0—price per bushel received by farmers for corn, average for November to May, cents.

X_1—total supply of feed concentrates for the year beginning in October, million tons.

X_2—grain-consuming animal units fed on farms during the year beginning in October, millions.

X_3—price received by farmers for livestock and livestock products, index numbers (1910–14=100), average for November to May.

The following regression equation applies:

$$\text{Log } X'_0 = -0.95 - 1.82 \log X_1 + 1.71 \log X_2 + 1.36 \log X_3 \qquad (1)$$

---

[1] FOOTE, RICHARD J., KLEIN, JOHN W., AND CLOUGH, MALCOLM, THE DEMAND AND PRICE STRUCTURE FOR CORN AND TOTAL FEED CONCENTRATES, U. S. Dept. Agr. Tech. Bul. 1061, 1952. FOOTE, RICHARD J., STATISTICAL ANALYSES RELATING TO THE FEED-LIVESTOCK ECONOMY, U. S. Dept. Agr. Tech. Bul. 1070, 1953. MEINKEN, KENNETH W., THE DEMAND AND PRICE STRUCTURE FOR OATS, BARLEY, AND SORGHUM GRAINS, U. S. Dept. Agr. Tech. Bul. 1080, 1953. MEINKEN, KENNETH W., THE DEMAND AND PRICE STRUCTURE FOR WHEAT, U. S. Dept. Agr. Tech. Bul. 1136, 1955.

For any given year, if expected values for X_2 and X_3 are inserted, this equation can be written in the following way:

$$\text{Log } X'_0=\log A_1-1.82\log X_1 \qquad (1.1)$$

where $\log A_1=-0.95+1.71\log X_2+1.36\log X_3$ for that year. In the rest of this paper, the form shown by (1.1) is used. The reader should remember, however, that the applicable value for $\log A_1$ must be obtained from equation (1).

The analysis for prices of corn makes no direct allowance for the effect of a price-support program. It is primarily of value in indicating prices that would be expected under free-market conditions if given supplies of feed concentrates were available. If prices under a support program are expected to be higher than those indicated by the analysis, the analysis suggests that part of the supply will need to be held off the market under the program, although it does not indicate directly how much must be removed.

The system of equations for wheat is described in detail on pages 36 to 50 of Technical Bulletin 1136. The analysis was based on data for the years 1921–29 and 1931–38. These are years for which direct price-support activities of the Government are believed to have had only minor effects on prices and utilization. The system can be used, however, to indicate probable effects on utilization of various types of price-support programs. Because of space limitations, a list of all variables taken as given for this system of equations cannot be included here. The list contains such items as supply of wheat, consumer income, freight rates, numbers of poultry on farms, and other variables that are believed to be affected only slightly, if at all, by economic factors not specified in the system of equations used to explain prices and utilization of wheat during a given marketing year. Included among these given variables is the price of corn, but, as is shown later, the system can be modified to include corn prices among the variables that are simultaneously determined within the system.

Variables that are assumed to be determined simultaneously within the original system of equations for wheat include the following—the symbolic letters are basically the same as those in Technical Bulletin 1136:

P_w—wholesale price per bushel of wheat at Liverpool, England, converted to United States currency, cents.

P_d—wholesale price per bushel of No. 2 Hard Winter wheat at Kansas City, cents.

C_f—domestic use of wheat for feed, million bushels.

C_e—domestic net exports of wheat and flour on a wheat equivalent basis, million bushels.

C_s—domestic end-of-year stocks of wheat, million bushels.

C_h—domestic use of wheat and wheat products for food by civilians on a wheat equivalent basis, million bushels.

All variables relate to a marketing year beginning in July. C_s is assumed to apply to stocks held in commercial hands. When a price-support program is in effect, end-of-year stocks under loan or held by the Commodity Credit Corporation are computed as a residual.

P_w is assumed to depend directly on certain given variables, hence its value in any year can be obtained by a direct solution of a single equation similar to equation (1) for corn. It then can be treated as though it were given. The values of the given variables and the calculated value of P_w for any year can be substituted in each equation. By making computations similar to those used in obtaining $\log A_1$, new constant terms can be obtained for each equation. The equations then can be written conveniently in the following form. These equations bear the same relation to the original equations as equation (1.1) does to (1).

$$\begin{array}{llr}
C_h+C_f+C_e+C_s & =A_2 & (2)\\
C_h \qquad\qquad +0.0015LP_d & =LA_3 & (3)\\
\quad C_f \qquad\quad +2.5P_d & =A_4 & (4)\\
\qquad C_e \qquad +7.8P_d & =A_5 & (5)\\
\qquad\qquad C_s+411(P_d/I_d) & =A_6 & (6)
\end{array}$$

Two given variables are involved in these equations. They are (1) L, the total population eating out of civilian supplies, in millions, and (2) I_d, wholesale prices of all commodities in this country as computed by the Bureau of Labor Statistics (1926=100). They cannot be included in the modified constants because they appear as a multiplier or divisor, respectively, of P_d.

By subtracting the last 4 equations from equation (2) and solving the resulting equation for P_d, the following formula is given:

$$P_d = \frac{A_2 - LA_3 - A_4 - A_5 - A_6}{-0.0015L - (411/I_d) - 10.3} \qquad (7)$$

Once a value for P_d is obtained, equations (3) to (6) can be solved directly, after inserting values for L and I_d, to obtain the 4 price-determined utilizations.

We are now ready to discuss how these analyses can be used to answer specified policy questions. Four types of questions are considered.

Effects of Eliminating Price Supports for Wheat While Retaining Them for Corn

For a number of commodities, the price-support program is retained at full rates only if a specified percentage of producers vote in favor of marketing quotas. This is true for wheat. In the spring of 1955, many people believed that producers might vote down marketing quotas for wheat; there is always the possibility that this might happen in later years. Questions were therefore raised as to what might happen to wheat prices if quotas were defeated. As no marketing quotas were involved for corn, it was logical to assume that the current support program would remain unchanged. From an analytical standpoint, this simplified the computations because, in the study for wheat, corn prices could be taken as given.

At the time the analysis was made, producers already had accepted quotas for the 1956 crop. Hence, the earliest year for which quotas could be rejected was the marketing year beginning in 1957. Separate estimates were made for each year beginning July from 1957–58 through 1960–61. On a judgment basis, it was assumed that production of wheat, with no restrictions on acreage, might increase to 1,080 million bushels, compared with 860 million bushels in 1955. Commercial stocks on July 1, 1957, were taken at 60 million bushels, about the same as for the same date in 1955; and it was assumed that stocks held under the support program could be impounded in such a way that farmers and members of the trade would know that these stocks would *not* affect domestic or world prices of wheat. In a study discussed in a later section of this article, an indication is given as to what might happen to prices if these stocks were released or "dumped" directly into commercial channels.

Prices of corn were taken at levels equivalent to those that might be expected under the support program if it were operated under existing legislation, assuming no change in the parity index from the level of mid-1955. A gradual decline in the price of corn was indicated, reflecting a continued build-up in supplies and a shift from "old" to "new" parity. Expected supplies of wheat in this country, less stocks impounded, were used in deriving expected world supplies, and population, poultry units, and "time" were based on expected values for the given years. Other given variables were taken at the same level as in 1954–55, the latest year for which data were available at the time of the study. The analysis is thus based on the assumption that economic conditions outside the grain economy shall remain at about the current level.

Two modifications in the system of equations shown on p. 34 were made.

The first involves the substitution of a curvilinear relationship between prices of wheat and the quantity of wheat fed to livestock for the linear relationship that is believed to apply when the spread between the price of wheat and the price of corn used in the analysis is between zero and 40 cents per 60 pounds (the weight of a bushel of wheat). For larger price spreads, requirements for wheat in poultry and other rations is more than the quantity indicated by the linear analysis. Thus, when use for feed is plotted on the vertical scale, a slope that becomes less steep is required. When the price of wheat approaches or falls below the comparable price of corn, use of wheat for feed increases rapidly and by more than that suggested by the linear relationship. For this part of the curve, a slope that becomes increasingly steep is required. When the price spread is outside the specified range, the quantity of wheat fed frequently can be estimated approximately by making use of a logarithmic relation between prices of wheat and quantity fed. This computation is described in detail on pages 89 to 93 of Technical Bulletin 1136.[2] Use of a curvilinear relation of this sort was required for all years for the data shown in the upper part of table 1 and for the year beginning 1957 in the lower part of the table. Considerations involved in developing the logarithmic analysis are described in detail on pages 23 to 25 of the bulletin on wheat.

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[2] Computations involved in incorporating results from the logarithmic equation in the system of equations are similar to those discussed on p. 37 involving a similar incorporation of results from the logarithmic analysis for prices of corn.

The second modification concerns equation (5) for exports. Because of the effect of institutional forces in the world today, it is believed that exports from this country that exceed specified levels will result in retaliatory action on the part of other governments. So long as our exports remain below these levels, it is likely that the same kind of economic forces will apply as those in the pre-World War II years on which the analysis was based. This adjustment in the system of equations can be made easily. The equations are first solved with no restriction on exports. If the indicated figure for C_e is higher than the specified maximum, the following formula is used to estimate P_d. In this formula, the symbol E is used to indicate the assumed maximum for exports.

$$P_d = \frac{A_2 - LA_3 - A_4 - E - A_6}{-0.0015L - (411/I_d) - 2.5} \qquad (7.1)$$

The reader can easily verify that this formula is obtained by substituting $C_e = E$ for equation (5), then deriving the formula for P_d by the same algebraic process as that used in the previous case. The other utilizations are obtained in the same way as previously. Table 1 shows results from the analysis when E is taken, respectively, as 400 and 300 million bushels. The latter quantity is probably more nearly representative of present-day conditions. Exports of 355 million bushels are indicated for the marketing year beginning in 1957 under the 400-million bushel maximum. This quantity was derived by making use of a price obtained from the original formula (7) for P_d. All of these computations assume the average export subsidy per bushel of wheat to be the same as in 1954–55.

One other minor modification was made to take account of the fact that, when questions of policy are considered, prices received by farmers rather than prices at a terminal market ordinarily are used. By using an analysis described on pages 70 to 71 of Technical Bulletin 1136, estimated prices of No. 2 Hard Winter wheat at Kansas City as obtained from the system of equations were converted to an equivalent price received by farmers. If P_d' is used to represent the price received by farmers in cents per bushel, the relationship is as follows:

$$P_d' = -5.4 + 0.92\,P_d \qquad (8)$$

TABLE 1.—*Wheat: Estimated price, supply, and utilization with a price-support program for corn but no program for wheat and with stocks of wheat under the loan program as of July 1, 1957, impounded, 1957–60*[1]

Exports restricted to not more than 400 million bushels

Item	Unit	Year beginning July			
		1957	1958	1959	1960
Price received by farmers per bushel.	Cts	195	190	180	175
Supply:					
Production	Mil. bu	1,080	1,080	1,080	1,080
Beginning stocks	do	60	120	140	160
Total	do	1,140	1,200	1,220	1,240
Utilization:					
Seed and industrial.	do	75	75	75	75
Food	do	480	475	475	475
Feed	do	110	110	110	110
Export	do	355	400	400	400
Ending stocks	do	120	140	160	180

Exports restricted to not more than 300 million bushels

Item	Unit	1957	1958	1959	1960
Prices received by farmers per bushel.	Cts	175	145	125	115
Supply:					
Production	Mil. bu	1,080	1,080	1,080	1,080
Beginning stocks	do	60	170	260	310
Total	do	1,140	1,250	1,340	1,390
Utilization:					
Seed and industrial.	do	75	75	75	75
Food	do	485	490	490	490
Feed	do	110	125	165	190
Export	do	300	300	300	300
Ending stocks	do	170	260	310	335

[1] Impounded stocks are assumed to have no effect on domestic or world prices.

Several inferences can be made from the data shown in table 1. Under the more realistic assumption with respect to exports, prices decline to $1.15 per bushel for the last year shown. As farmers and the trade might anticipate a decline of this kind, it is possible that prices for earlier years would sag below those suggested by the analysis. The analysis suggests that if exports somehow could be increased to around 420 million bushels a year, prices might remain at around $1.90 per bushel, *once present surpluses are disposed of*, even though production controls were eliminated.

This can be compared with the expected price of \$2.00 for 1955–56 under the present program. However, even if present "surpluses" were, in effect, completely eliminated, prices apparently would decline rapidly to a relatively low level unless either (1) production controls were retained, or (2) exports could be increased materially. In the table, ending stocks are shown as a residual; in the analysis they were obtained simultaneously with utilization items other than seed and industrial.

Effect of "Elimination of Surpluses" in 1955–56 Given Existing Support Programs

Another question of interest is "What would happen to agricultural prices if we got rid of our burdensome surpluses?" For wheat, a partial answer is given by the preceding example. But we may also ask, What price would prevail during the 1955–56 marketing year if stocks under loan, or held by the Commodity Credit Corporation as of the start of the year, were impounded so as to nullify their effect on market prices? The basic analyses discussed in the first section of this article can be used to provide an answer to this question as it applies to wheat and corn.

On the surface, the problem looks fairly simple. Stocks of wheat other than those in commercial hands on July 1, 1955, were 990 million bushels, and similar stocks of feed grains that enter into the supply of total feed concentrates at the beginning of the 1955–56 marketing season were 30 million tons. The latter includes stocks of oats and barley under loan or owned by the Commodity Credit Corporation as of July 1, and stocks of corn and sorghum grains as of October 1. One might assume that the answer might be reached by deducting these stocks from the total supplies in the respective analyses, inserting expected values for the other given variables, and obtaining expected values for the various dependent variables. But the quantity of wheat fed depends partly on the price of corn, and the price of corn depends to some extent on the quantity of wheat fed. Hence, it seemed desirable to modify the system of equations for wheat so that the price of corn could be included among the simultaneously determined variables.

If the analysis for corn had been based on a linear, rather than a logarithmic, relationship, this could have been done easily. In the next few paragraphs we discuss how a linear relationship was derived from the logarithmic one for corn. The linear relation can be used as an approximation for the logarithmic if changes in X_1 from the initial value are small.[3]

To simplify the discussion, we first rewrite equation (1.1) by substituting the letter *b* for the numerical value of the regression coefficient. Thus $b = -1.82$. The equation then reads:

$$\log X'_0 = \log A_1 + b \log X_1 \qquad (1.2)$$

If we translate this equation into actual numbers (rather than logarithms) we obtain:

$$X'_0 = A_1 X_1^{b} \qquad (1.3)$$

We now borrow a notion from differential calculus. To get the slope of a curve at any given point, we need to evaluate the first derivative at that point. The first derivative of the function (1.3) with respect to X_1 is:

$$\frac{dX'_0}{dX_1} = bA_1X_1^{b-1} \qquad (9)$$

Inserting the value for *b*, we get:

$$\frac{dX'_0}{dX_1} = -1.82A_1X_1^{-2.82} \qquad (9.1)$$

We wish to evaluate the slope of the line when X_1—total supply of feed concentrates—is at its expected level, for the particular analysis, making use of the appropriate value of A_1. As of the start of the analysis, we know all values that enter into X_1 except the quantity of wheat to be fed during the crop year, and that we can estimate approximately. In most instances, an error of as much as 100 percent in our advance estimate of the quantity of wheat fed will affect X_1 by only a few percentage points (as the quantity of wheat fed normally constitutes only about 2 percent of the total supply of feed concentrates) and will affect the estimate of the slope of the line even less. If the initial estimate of the quantity of wheat fed is found to be badly off, after making the computations for the system of equations, so that the computed linear relationship is a poor approximation to the true curve, we can always make a better approximation by using a revised value for X_1 and then making a new set of computations for the system.[4] Let us designate the answer obtained from (9.1) as B. The reader should note that logarithms are needed to evaluate the expression $X_1^{-2.82}$.

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[3] This general approach is described by ALLEN, R. G. D., MATHEMATICAL ANALYSIS FOR ECONOMISTS, Cambridge Univ. Press, New York, 1947, page 145. It was developed independently in this study by the authors.

We now wish to obtain a linear equation that has the slope B and that passes through the point on the original logarithmic curve at the chosen value for X_1. By substituting the estimated value of X_1 in equation (1.1), we can obtain an estimated value for X_0 at that point. Let us designate these numbers by the symbols $\hat{X}_0$, $\hat{X}_1$. We now can write the equation of the desired linear relation as:

$$X'_0 = (\hat{X}_0 - B\hat{X}_1) + BX_1 \tag{10}$$

The reader who remembers his elementary analytical geometry will see that this is the equation of a line for which we know the slope and 1 point.

We must now effect some further transformations to make equation (10) apply to the variables included in the system of equations for wheat. For the combined analysis, all of X_1 is assumed to be given except the quantity of wheat fed. This can be allowed for in the equation by letting

$$X_1 = X_1'' + C_f'' \tag{11}$$

BX_1'' then can be combined with the other constant terms in the equation. The symbol C_f'' is used because this is in terms of million tons, while C_f, as used in the system of equations for wheat, is in million bushels. The relationship between C_f'' and C_f is given by:

$$C_f'' = \frac{60}{2{,}000} C_f \tag{12}$$

In the system of equations for wheat, the price of corn, P_c, relates to 60 pounds of No. 3 Yellow at Chicago, average for July–December, in cents, whereas X_0 is the average price received by farmers per standard or 56-pound bushel, average for November–May, in cents. A relationship between P_c and X_0 can be developed in several ways, one of which follows: (1) Based on the computation discussed on page 12 of Technical Bulletin 1070, the season-average price received by farmers for corn equals approximately $X_0/0.95$. (2) Based on an analysis referred to on page 65 of Technical Bulletin 1061, the annual average price of No. 3 Yellow corn at Chicago equals the annual price received by farmers for all corn times 1.05 plus 1.11 cents. (3) Based on index numbers of normal seasonal variation for No. 3 Yellow corn at Chicago as shown on page 50 of that bulletin, the July–December price at Chicago equals 1.017 times the annual price. (4) The price of 60 pounds of corn naturally equals 60/56 times the price of a standard bushel. By combining these relationships, we find that

$$X_0 = 0.83P_c - 1.004 \tag{13}$$

If we make the three substitutions implied by equations (11), (12), and (13), we can rewrite equation (10) as

$$P_o = 1.\hat{2}(X_o - \hat{B}X_1 + BX_1'' + 1.004)''_1{}' + 0.036\,BC_f \tag{10.1}$$

By letting $A_7 = 1.2(\hat{X}_o - B\hat{X}_1 + BX_1'' + 1.004)$ and $b_{71} = 0.036B$, we can rewrite this as

$$P_c = A_7 + b_{71}C_f \tag{10.2}$$

The equation in this form is used in the rest of the discussion. In following it, one should keep in mind the substantial number of computations involved in obtaining A_7 and b_{71}.

We are now ready to consider the system of equations that includes (10.2). Referring to page 34, if equations (3), (5), and (6) are subtracted from equation (2), equation (14) shown below is given. Equation (4) now must be modified to show P_c as a separate variable. This is done by removing $2.5P_c$ from A_4 and transposing this term to the opposite side of the equality sign. The modified equation is designated as equation (4.1) in the system shown below, and the modified A_4, as A'_4. Equations (14), (4.1), and (10.2) can be written conveniently as follows:

$$\begin{array}{lllll} C_f - (0.0015L + 7.8 + 411/I_d)P_d & & & = A_2 - LA_3 - A_5 - A_6 & (14) \\ C_f & +2.5P_d & -2.5P_c & = A'_4 & (4.1) \\ -b_{71}C_f & & +P_c & = A_7 & (10.2) \end{array}$$

If equation (10.2) is multiplied by -2.5 and subtracted from equation (4.1), the following equation results:

$$(1 - 2.5b_{71})C_f + 2.5P_d = A_4' + 2.5A_7 \tag{15}$$

If equation (14) is multiplied by $(1 - 2.5b_{71})$ and subtracted from equation (15), a formula for P_d can be derived directly. To write this in algebraic symbols is somewhat complicated but, when working with numbers in an actual problem, it would be very simple. A value for C_f then can be obtained from equation (14), P_c can be obtained from equation (10.2), and the other price-determined utilizations for wheat can be obtained easily from the initial equations.

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[4] In the analyses discussed here, three iterations normally were required to verify that the answers were correct to the nearest cent on prices and the nearest million bushels on utilization.

This approach was used to estimate the effects on prices of wheat and corn if stocks controlled by the Government as of the start of the 1955–56 marketing year were impounded so that they could not affect domestic or world prices. Results are shown in table 2. The stocks impounded are shown in the row for Government stocks. To show the effect of export subsidies, two sets of computations were made. One assumes the same average export subsidy per bushel as in 1954–55, whereas the other assumes no export subsidies. Prices shown in the last column are those that are expected by commodity analysts to prevail under the support programs in 1955–56. Utilization for food, feed, export, and commercial carryover were obtained from the system of equations, making use of the expected levels of prices for wheat and corn. Government stocks were taken as a residual. In making these computations, export subsidies were assumed to be at the same rate per bushel as in 1954–55. In all instances, quantitities fed were computed by making use of the logarithmic analysis referred to on page 35.

Comparison of the prices shown in the first and last columns suggests that stocks controlled by the Government are fairly effectively isolated from the market under existing conditions. Their complete elimination, as implied by the first set of computations, would result in price increases of not more than 10 percent.

The average export subsidy in 1954–55 was 38.5 cents per bushel. This was computed by taking subsidies paid per bushel under the International Wheat Agreement times the number of bushels shipped under the agreement and dividing by total exports during the marketing year. Comparison of the prices shown in the first 2 columns of table 2 suggests that prices of all wheat might decline by about 25 cents a bushel if this subsidy were eliminated, but that prices of corn would be approximately unaffected. The analysis suggests that exports with no subsidy would decline substantially.

The reader may question why commercial stocks, as shown in the last column, are so much higher than those shown in the first column, whereas all other price-determined utilizations are about the same in the two columns. This reflects a number of factors. Use for food and feed are nearly the same because demand for each under the conditions specified is highly inelastic. Exports are about the same because, whereas domestic prices are somewhat lower in the last than in the first column, world prices as estimated from the system of equations also are lower when all stocks are included in supply; the difference between world and domestic prices affects exports rather than the level of either series separately. Thus the only series which reflects much change as a result of the lower domestic prices is the level of stocks. Commercial stocks on July 1, 1956, are likely to be lower than the 110 million bushels suggested by the system of equations, but exports probably will be larger than the 170 million bushels indicated because of special Governmental programs not taken into account by the system.

TABLE 2.—*Estimated prices of wheat and corn and utilization of wheat with Government stocks as of the beginning of the 1955–56 marketing year impounded, as compared with expected values under existing conditions, marketing year beginning 1955* [1]

Item	Unit	Stocks impounded and export subsidy at—		Existing conditions with export subsidy at same level as in 1954–55
		Same level as in 1954–55	Zero	
Price received by farmers per bushel:				
Corn	Cts	130	130	125
Wheat	do	220	195	200
Wheat:				
Utilization:				
Food	Mil. bu	500	505	505
Feed	do	105	110	105
Export	do	175	95	170
Seed and industrial	do	75	75	75
Ending stocks:				
Commercial	do	60	130	110
Government	do	990	990	[2] 940

[1] Stocks impounded are assumed to have no effect on domestic or world prices.

[2] Residual.

Effect of Eliminating Price Supports for Both Wheat and Corn

Another kind of analysis that can be made is to estimate free-market prices for commodities currently in surplus under assumptions such as (1) that all stocks under loan or held by CCC are dumped on the market in a single year; and (2) that these stocks are disposed of in such a way as to have no effect on market prices. As we can think of no way in which such a disposal could be carried out, the second assumption is reworded to conform to that in previous examples, that is, that stocks are impounded in such a way as to have no effect on domestic or world prices.

Estimates were made for marketing years beginning in 1956 and in 1959, with all dumping assumed to take place in 1956. The year 1959 was chosen to allow for some longer range adjustments. In some instances, estimates for wheat and corn also were made for intervening years; results shown here are for the 2 periods only. We naturally assumed that acreage controls were eliminated. Basic assumptions of the magnitude of certain supply variables are shown in table 3, together with results of the analysis. For all estimates, the general level of economic activity was taken to be the same as that prevailing in 1953–54. Subsequent tests compared results based on this level with those obtained under conditions prevailing in 1954–55. Only minor differences were indicated.

In deriving A_1, the number of animal units with Government stocks impounded was assumed to be the same as the expected number for 1955–56; with Government stocks included in the commercial supply, an increase of 6 percent above 1955–56 was assumed. This is about as large an increase as would be expected in a single year under the assumed conditions. To estimate an associated price for livestock products, this number of animal units was used in an equation given on page 21 of Technical Bulletin 1070, assuming no change in disposable income from the level of the previous year. These 2 variables—animal units and prices of livestock products—are involved in the computation of A_1.

Results shown in columns 1 and 3 of table 3 were obtained directly from the system of equations. An adjustment for feed of the kind described on p. 35 should have been made for the year beginning in 1956, with Government stocks impounded, but the resulting error was believed to be so small that further manipulation of the model was regarded as unwarranted. A figure of around 100 million bushels probably would have been obtained instead of 75 million bushels as shown in the table.

When Government stocks were assumed to be sold through commercial channels for the year beginning in 1956, and exports were restricted to not more than 400 million bushels, a direct solution of the equations gave a price estimate of 3 cents a bushel for wheat at Kansas City and 93 cents for corn at Chicago. The reason for this implausible result is as follows: When the price of wheat falls to near or below that for corn, the demand for wheat for feeding is much more elastic than when the price is considerably above that for corn. The logarithmic analysis for wheat fed could not be used in this instance because the logarithm of a negative number is undefined. The following method was used instead: A 20-cent negative differential between prices received by farmers for wheat and corn seemed like a maximum, and the regression coefficient for (P_d–P_c) in equation (4.1) was adjusted in such a way as to reduce the negative price differential to this level.[5]

The algebra involved in obtaining the adjusted coefficient is rather complicated and need not be shown in detail here. The general approach is as follows: (1) By making use of the relationships previously described between prices received by farmers and prices at specified terminal markets, the algebraic value for P_d–P_c that is equivalent to a negative spread of 20 cents at the farm level can be obtained. Let this algebraic value equal M. (2) Equation (4.1) (see p. 38) is modified to substitute a regression coefficient for P_d–P_c that is unknown for the value of 2.5 used under normal circumstances. Call this coefficient K. (3) M is substituted for P_d–P_c in equation (4.1) and P_d–M is substituted for P_c in equation (10.2). This eliminates P_c from the equations.

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[5] A negative differential of this magnitude seems reasonable if supplies of wheat available for feeding relative to demand are expected to be extremely large. In certain analyses made after the writing of this article, supplies of wheat available for feeding were expected to be much larger than normal but the demand for feed also was expected to be abnormally large. Here a zero differential between P_d and P_c was used, that is, P_d was not permitted to be less than P_c. The basic algebraic formulation is the same in either case.

TABLE 3.—*Estimated price, supply, and utilization of wheat and feed concentrates with no price-support operations, marketing years beginning 1956 and 1959*

Item	Unit	With Government stocks at the beginning of the 1956 marketing year—				
		Impounded [1]		Included as part of total supply		
		1956	1959	No restriction on exports, 1956	Exports restricted to not more than 400 million bushels	
					1956	1959
Price per bushel received by farmers:						
Wheat	Cts	165	124	88	56	115
Corn	do	119	115	87	76	114
Wheat:						
Production	Mil. bu	1, 160	1, 160	1, 160	1, 160	1, 160
Stocks	do	50	300	925	925	355
Total supply	do	1, 210	1, 460	2, 085	2, 085	1, 515
Utilization:						
Seed and industrial	do	86	86	86	86	86
Food	do	479	495	506	515	498
Feed	do	75	177	204	601	205
Export	do	375	400	890	400	400
End-of-year storage	do	194	302	398	483	327
Feed concentrates:						
Production of feed grains	Mil. tons	120	120	120	120	120
Wheat fed	do	2	5	6	18	6
Other feeds fed	do	24	24	24	24	24
Stocks	do	12	12	35	35	9
Total supply	do	158	161	185	197	159
Utilization:						
Feed	do	130	133	146	156	133
Food, industry, seed, export	do	16	16	21	21	16
End-of-year storage	do	12	12	18	20	10
Grain-consuming animal units [2]	Mil	174	176	183	183	182
Feed fed per animal unit [2]	Tons	. 75	. 76	. 80	. 85	. 73

[1] Impounded stocks are assumed to have no effect on domestic or world prices.

[2] Livestock numbers and rates of feeding are based on estimates made prior to the recent revisions based on 1954 census data.

(4) Equations (14), (4.1), and (10.2) now contain 3 unknowns—C_f, P_d, and K. As some of the equations may be nonlinear, part of the solution of them may need to be made graphically. Once values for C_f, P_d, and K have been obtained, the other desired unknowns can be obtained easily. A regression coefficient of 11 instead of 2.5 was used in obtaining the estimates shown in the next to the last column.

Estimates for the year beginning in 1959, when Government stocks are impounded, are based on a beginning carryover of 300 million bushels of wheat. This quantity was chosen, after some experimentation, because it appeared to represent an equilibrium; ending stocks, as derived from the system of equations, are 302 million bushels.

Data shown in the last column were obtained year by year by using the following general approach: (1) The number of animal units to be fed was estimated by commodity specialists on our staff, making use of the estimates of feed prices and carryover of feed concentrates from the statistical analysis for the previous year. Originally, we had expected to make these estimates from an equation described on page 14 of Technical Bulletin 1070, but this appears to be no longer applicable.[6] (2) An associated price for livestock was obtained in the way described on p. 40. (3) These results were used to obtain an estimate of A_1, and the remaining computations were carried out in the usual way, using as beginning stocks the carryover from the preceding year.

End-of-year carryover for wheat decreased continuously and was still decreasing in 1959. Hence, somewhat higher prices than those shown for the year beginning in 1959 would be anticipated at a long-run equilibrium level. Utilization estimates for feed were made on a judgment basis by Malcolm Clough of our staff taking into consideration probable livestock numbers and the rate of feeding per animal unit with the given feed grain supplies and the derived prices of feed. The carryover for feed was taken as a residual, except for a restriction that stocks could not fall below a minimum working level.

Results shown in table 3 with Government stocks impounded can be compared with those in the upper section of table 1 to indicate the effect of a price-support and acreage-control program for corn and other crops on the price of wheat. Contrary to what might be expected on first thought, production of wheat was assumed to average around 1,080 million bushels with controls for other crops and to increase to 1,160 million bushels if these controls were eliminated. This assumed change grows out of a consideration of the effects of acreage controls on other crops that compete for land with wheat. When allowance is made for the expected difference in production of wheat, price supports and acreage-control programs for other crops apparently affect the price of wheat considerably. If a comparison that makes no allowance for a change in production of wheat is desired it can be obtained by comparing the data in table 3 with those in the lower section of table 1, as a difference of 100 million bushels for export would about compensate for the 80-million bushel difference in production. When the comparison is made in this way, prices for wheat when a program is in effect for corn are found to be only slightly higher than prices for wheat when no program exists for corn.

Effects of a Multiple-Price Plan for Wheat

On pages 49 to 50 of Technical Bulletin 1136, Meinken describes how his system of equations can be used to study the effect of multiple-price plans. Suppose a 2-price plan is in effect under which wheat used for domestic food consumption is sold at a price equivalent to 100 percent of parity, while the remaining wheat sells at a free-market price. The amount of wheat used for food could be estimated from equation (3) (see p. 34) based on a value for P_d equivalent to the parity price. Suppose this amount is $\hat{C}_h$. The equation $C_h = \hat{C}_h$ is substituted for equation (3), and the system is solved for the other variables in the same way as described on p. 34.

If the Government were to place a floor under the "free" price at say 50 percent of parity, an estimate of the quantity of wheat going under the support program at this price, if any, could be obtained as a residual after computing the expected utilizations and commercial carryover. If the Government established a price for wheat used for food and a lower price for wheat used for feed, an approach similar to that described above could be used to solve for the expected utilizations for food and feed and the free-market price at which the remaining wheat would sell. Computations of this sort are relatively easy, but, as with the other analyses discussed in this study, many assumptions must be made.

Summary

This article describes four types of policy questions for wheat and corn that can be analyzed by using the research results contained in three recently-issued technical bulletins. Emphasis is placed on the algebraic manipulations required to allow for special circumstances. It is believed by some economic analysts that mathematical systems of equations are inflexible and difficult to adjust to allow for special circumstances; cases described in this article show this not to be true. Structural models are highly flexible and they can be modified to allow for many special circumstances. Moreover, results from the analysis can be combined with judgment estimates on the part of commodity specialists when this appears desirable. The advantages that a structural analysis of this kind has over one based entirely on judgment are that all interrelated estimates automatically are consistent, one with another, and account automatically is taken of those statistical relationships that are believed to be valid.

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[6] The animal unit series is a weighted aggregate of the various groups of livestock on farms. More reliable projections of the total number of animal units can be derived by obtaining individual estimates of livestock numbers from the livestock commodity specialists, and combining these into the animal unit series, than by deriving the aggregate number from statistical relationships. This is especially true if the projection is made for only a year or two ahead, as reports on plans of farmers and current trends in numbers can be taken into account. For more distant projections, the statistical equations might yield better results than those obtained on a judgment basis.

The Farmer's Share: Three Measurements

By Kenneth E. Ogren

The United States Department of Agriculture has long published statistics on the farmer's share of the consumer's food dollar based on a "market-basket" series. Questions frequently arise as to the interpretation of these statistics. This article describes the meaning of this series and considers two other series that can be used both to measure the part of consumers' food expenditures going to farmers and to provide other useful measurements in analyzing trends in marketing services and charges.

STATISTICS on the farmer's share of the consumer's food dollar published regularly by the Agricultural Marketing Service in *The Marketing and Transportation Situation* and other periodicals have received much public attention in recent years. This interest has been stimulated by the almost continuous decline in the farmer's share since early in 1951.

Consumer expenditures for food products are made up of two parts: (1) Payments going to farmers, which represent primarily the returns for the production of raw materials used in food products, and (2) payments going to agencies that assemble and process these raw materials and perform other functions necessary to get food products to consumers in the form, time, and place desired. For purposes of this article, the second group are referred to as payments for "marketing services."

Variations in services performed in marketing a product or group of products must be considered in any comparisons of farmer's shares. The extent of these marketing services may change because of shifts in kinds and relative quantities of food bought by consumers . Shifts in distribution channels, such as the buying of more restaurant meals, affect total marketing services. Shifts in production and population centers also affect transportation and other marketing services required. Therefore, any interpretation of changes in the farmer's share of the food dollar over time, or of variations between products and product groups, should be considered in relation to variations and trends in marketing services.

The farmer's share calculated from the "market-basket" statistics compares urban retail-store prices of farm food products with payments received by farmers for equivalent quantities of produce. The purpose of this article is (1) to discuss the calculation and interpretation of this series and (2) to consider two other series from which a farmer's share may be derived. One of the two other series is derived from a comparison of total consumer expenditures for farm food products with the total farm receipts from sale of these products by United States farmers (adjusted for value of inedible byproducts). The other compares the same total consumer expenditures with the "value added" by agriculture, that is, the gross returns received by agriculture for its labor and capital, excluding the cost of purchased production materials and services.

As illustrated in figure 1, the measurement of the farmer's share given by each of these series varies both as to the level and trend during the period 1929 to date. This variation is related to the type of measurement being made in each instance. Each series has particular uses and applications in addition to the function of estimating the farmer's share.

The "Market-Basket" Series

Farm-retail price spreads are calculated regularly for a "market basket" of farm food products, commodity groups, and individual foods in the market basket. Statistics in these series include the retail-store cost or price, the farm value of equivalent quantities of produce, the marketing margin or farm-to-retail price spread, and the farmer's share of the retail cost. The principal purpose of these computations is to derive estimates of trends in the marketing margin and the farmer's share of the consumer's food dollar.

The retail-store cost and farm value are computed for the most part from average retail, wholesale, and farm prices that are published in connection with the various price indexes of the Bureau of Labor Statistics and the Agricultural Marketing Service. The marketing margin is the difference between the retail cost and farm value. The farmer's share of the consumer's dollar for the total market basket, or for commodity groups and individual products, is calculated by dividing the farm value by the retail-store price or cost. The farmer's share as measured in the "market-basket" series, therefore, applies only to the consumer's food dollar spent in retail food stores. It does not measure the farmer's share of consumer expenditures for food bought through other distributive channels.

These statistics are based on comparisons of retail-store prices paid by urban consumers for farm food products and payments received by farmers for equivalent quantities of produce (table 1). More specifically, the retail-store cost is computed for a typical family market basket of foods which includes the estimated quantities of farm food products bought for consumption at home per urban wage-earner and clerical-worker family in 1952. For each of the retail quantities, corresponding farm-produce equivalents are estimated. The "farm value" in table 1 is computed by multiplying the farm-produce equivalents by average prices received by farmers.[1]

An essential feature of the market-basket series is that the retail cost and farm value of a fixed quantity of food products are computed. These series are index-number measurements, although current statistics are published in the form of value aggregates so that dollar changes in the retail cost of the market basket can be related to dollar changes in the farm value and marketing margin.[2] These series or indexes are concerned with measuring changes in prices and marketing margins, not with the effects of changes in marketing services and types and quantities of foods bought by consumers.

The principal advantage of the "market-basket" statistics over other possible measurements is that

Table 1.—*The farm food market basket: Retail cost, farm value, marketing margin, and farmer's share of retail cost, 1947–55*

Year	Retail cost [1]	Farm value [2]	Marketing margin	Farmer's share
	Dollars	*Dollars*	*Dollars*	*Percent*
1947	932	471	461	51
1948	994	498	496	50
1949	939	435	504	46
1950	924	432	492	47
1951	1,026	495	531	48
1952	1,035	482	553	47
1953	1,010	450	560	45
1954	993	425	568	43
1955	975	396	579	41

[1] Retail cost of average quantities of farm foods purchased per urban wage-earner and clerical-worker family in 1952, calculated from retail prices collected by the Bureau of Labor Statistics.

[2] Payment to farmers for equivalent quantities of farm produce minus imputed farm value of byproducts obtained in processing.

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[1] For commodities from which nonfood byproducts are obtained in processing, the "farm value" is adjusted to allow for the value of these byproducts. A fuller explanation of the nature of this adjustment and other details concerning the calculation of these statistics are given in "Price Spreads for Farm Food Products, Revised Series, 1946 to Date" in the *Supplement* for July–September 1953 to *The Marketing and Transportation Situation*.

[2] Over a period of time, however, it is necessary to change weights to maintain representativeness of current food purchase patterns. Therefore, longer time series are published in the form of index numbers as in table 2.

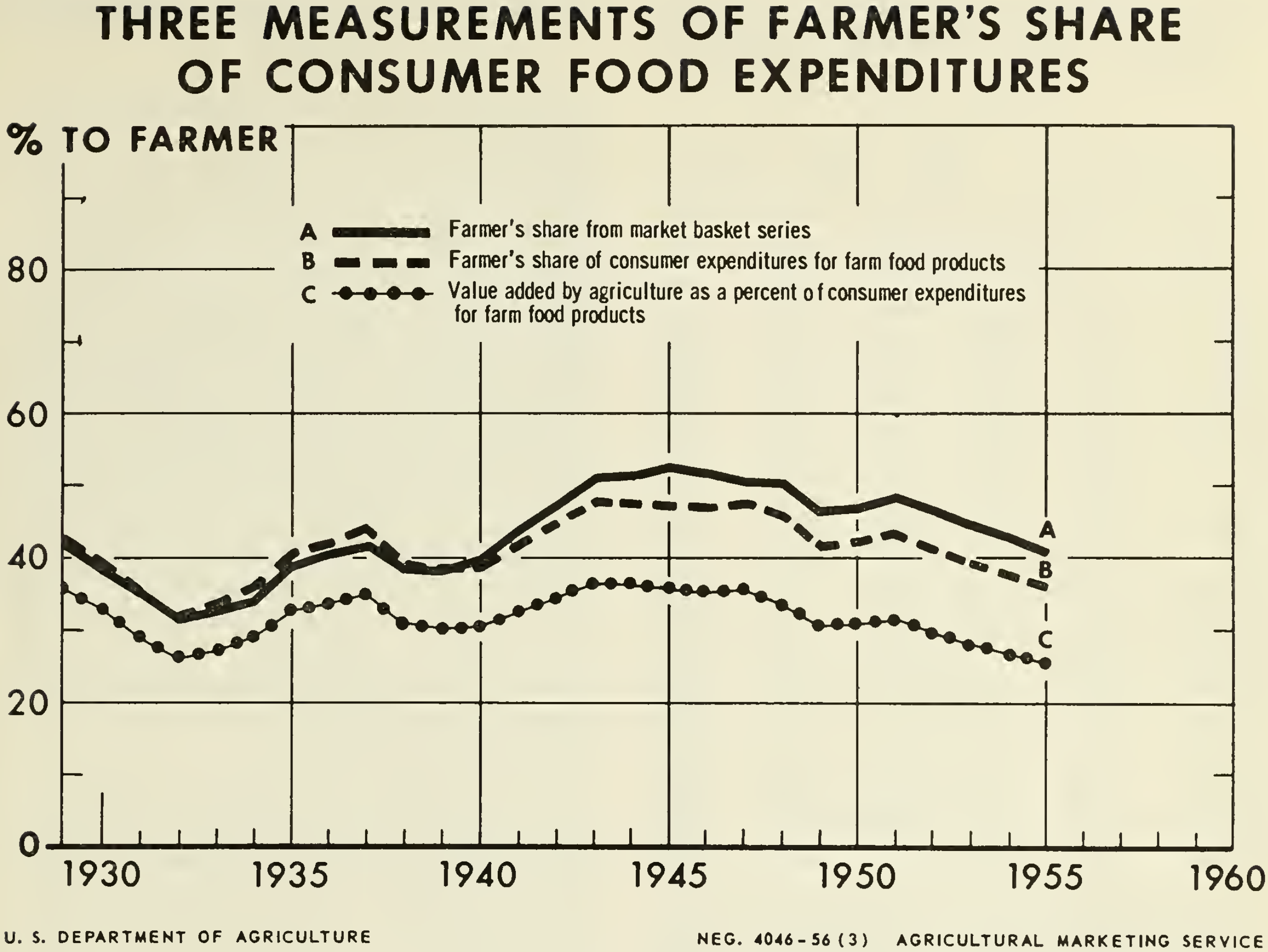

Figure 1.

the marketing margin provides the best approximation for measuring changes in the cost of a fixed quantity of marketing services (table 2). The marketing margin measures the trend in charges made by marketing agencies for the "quantity" of marketing services associated with the fixed quantities of food products in the family market basket bought in retail food stores. In short-term comparisons, the quantity of marketing services measured by the "market-basket" series may remain nearly constant. The effects of changes in pricing specifications and weights are minimized by "linking" prices based on comparable units. But over a longer period of time marketing services do change even in comparisons of the same units at farm and retail store. Prices received by farmers may change because of shifts in marketing channels used by farmers. Retail stores may vary the services they perform, such as credit service and delivery. Changes in marketing services such as washing or prepackaging of fresh produce may affect quality of foods which cannot be reflected in specifications used by the Bureau of Labor Statistics in reporting retail-store prices.

Other advantages of the market-basket statistics are that they give us a convenient, easily computed measurement[3] of trends in farm-retail price spreads or unit marketing charges and of the portions of the consumer's retail food dollar that go to farmers and other groups in the economy. Data are available to meet demands for current use,

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[3] Problems in developing methods for computing these series for many food products are neither simple nor uncomplicated, but once established, actual computation of the series is relatively straightforward.

TABLE 2.—*Farm food products: Indexes of retail cost, farm value, and marketing margin, annual 1929–55* [1]

(1947–49=100)

Year	Retail cost	Farm value	Marketing margin
1929	66	56	77
1930	64	50	78
1931	52	37	66
1932	43	27	59
1933	42	27	[2] 56
1934	47	32	[2] 59
1935	53	41	[2] 62
1936	53	43	63
1937	55	46	64
1938	50	39	61
1939	48	37	59
1940	48	39	58
1941	53	47	59
1942	62	59	65
1943	70	72	[2] 69
1944	69	71	[2] 70
1945	70	75	[2] 70
1946	80	85	[2] 79
1947	98	101	95
1948	104	106	102
1949	98	93	103
1950	97	92	101
1951	107	106	109
1952	108	103	114
1953	106	96	115
1954	104	91	117
1955 [3]	102	85	119

[1] Data for 1946 and later years are for a market basket of farm foods representative of those bought by urban wage-earner and clerical-worker families in 1952. For the years before 1946, the series were derived from data for a market basket containing the average annual quantities of farm foods purchased per family of 3 average consumers in 1935–39. Index numbers were computed by "linking" the series at 1946. The dollar figures for the market-basket series, which are published currently in *The Marketing and Transportation Situation*, can be converted to index numbers by dividing by the following 1947–49 averages: Retail cost, $955; farm value, $468; marketing margin, $487.

[2] Adjusted for Government processing taxes and payments to processors during 1933–35 and 1943–46.

[3] Preliminary estimates.

not only for the market basket and food commodity groups but also for many individual food products.

The principal limitation of the series, in addition to the inadequacy of available price data, is that it applies only to the farm-to-retail-store marketing channel. Not fully measured are the effects of changes in marketing channels used and in services provided by processing and distribution agencies on the distribution of the consumer's food dollar.

Aggregate Food Expenditures and Marketing Charges

Annual estimates of aggregate charges for marketing all farm food products from farm sale to retail-store level are developed in the "marketing-bill" series, which is published regularly in *The Marketing and Transportation Situation.*[4] Other statistics in this series are "retail cost" and "payment to farmers," total and by major commodity groups. Retail cost represents estimated cost at retail-store prices of all domestic farm foods that were both sold by farmers and bought by United States civilian consumers. The payment to farmers is the total cash receipts of farmers from the marketing of these food products (adjusted for imputed value of nonfood byproducts). These estimates of retail cost and the marketing bill reflect variations in total volume of food marketed, variations in marketing margins, and effects of changes in marketing services associated with changes in relative importance of various foods bought by consumers—for example, a shift from flour to bread.

In computing these statistics, cash farm receipts from sales of food products are adjusted to eliminate (1) food sales not reaching domestic civilian consumers and (2) imputed values of nonfood byproducts. In general, estimates of the retail-store cost of a commodity or product group are made by dividing adjusted cash farm receipts by the farmer's share for the individual commodity or product group. The accuracy of the estimated retail cost depends primarily on the reliability of cash farm receipts as adjusted and the estimates of the farmer's share of retail price. Although retail prices are available for most of the important food products, they are not available for many processed and packaged food products. Increased marketing services provided to consumers in some of these products may not be reflected fully in this series. Where reasonably good estimates of prices and volume can be made, allowance is made for effects of changes in marketing services, such as the increased proportion of potatoes sold in the form of potato chips or the additional cost resulting from the shifts to smaller can sizes for canned fruits and vegetables.

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[4] For most recent statistics, see the July and October 1955 issues of *The Marketing and Transportation Situation.*

We know that much food is bought through outlets other than retail stores and that the proportion of total food bought in retail stores varies; hence, a different measurement is needed to reflect these changes in marketing services. The market value of all farm food products given in table 3 estimates total consumer expenditures for all farm food products—valued at its price at the place in the marketing system where it was bought by consumers.[5] The market value in table 3 was derived by adjusting the retail-store cost in the "marketing-bill" series for the extra costs of food sold through restaurants and other eating places and for the lower costs of food bought directly from producers or wholesalers and jobbers selling below retail prices.[6] The aggregate marketing charges given in table 3 thus reflect the effects of changes in volume, unit marketing costs, and most of the changes in marketing services provided. This series, therefore, provides a more appropriate basis for measuring what part of total consumer expenditures for food does go back to the farmer. And as such, it provides a better starting point for analysis of changes in the division of the food dollar, the changes in resources employed in the farm production, processing, and distribution of these products related to changes in unit marketing costs, volumes, and marketing services.[7]

TABLE 3.—*Total market value, payment to farmers, and aggregate marketing charges for farm food products purchased by domestic civilian consumers, 1929–55* [1]

Year	Market value	Payment to farmers	Aggregate marketing charges
	Billion dollars	*Billion dollars*	*Billion dollars*
1929	16. 8	7. 2	9. 6
1930	16. 1	6. 3	9. 8
1931	13. 3	4. 7	8. 6
1932	10. 7	3. 4	7. 3
1933	10. 7	3. 6	[2] 7. 0
1934	11. 9	4. 3	[2] 7. 3
1935	12. 4	5. 0	[2] 7. 1
1936	13. 8	5. 8	8. 0
1937	13. 6	6. 0	7. 9
1938	13. 3	5. 2	8. 1
1939	13. 5	5. 2	8. 3
1940	14. 5	5. 6	8. 9
1941	16. 9	7. 1	9. 8
1942	20. 9	9. 3	11. 6
1943	23. 9	11. 4	[3] 12. 6
1944	24. 4	11. 6	[3] 13. 3
1945	26. 8	12. 6	[3] 14. 9
1946	33. 5	15. 7	[3] 18. 3
1947	39. 2	18. 7	20. 5
1948	42. 1	19. 2	22. 9
1949	41. 2	17. 1	24. 1
1950	42. 0	17. 7	24. 3
1951	46. 9	20. 3	26. 6
1952	48. 8	20. 2	28. 6
1953	49. 4	19. 3	30. 1
1954	49. 9	18. 8	31. 1
1955	50. 8	18. 3	32. 5

[1] The market-value estimates are in terms of the cost of food at the various levels of distribution bought by consumers. They represent the cost of all domestic farm foods that were both sold by farmers and bought by civilian consumers in this country. Payment to farmers is adjusted to eliminate imputed value of nonfood byproducts. The marketing bill is the difference between the market value and the payment to farmers, adjusted for processing taxes and Government subsidies for certain years.

[2] Excludes estimated processing taxes.

[3] Includes Government subsidies.

The principal limitations to the use of this series are the rough approximations required to estimate the statistics in this series and the fact that no data are available for current measurements and that it is not possible to estimate data for commodity groups or individual products.

Value-Added Measurements

"Value added by manufacture" is a statistic that for many years has been used by the United States Bureau of the Census in its periodic Census of Manufactures. Value added is calculated, according to the Bureau, "by subtracting the cost of

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[5] This series is not comparable with expenditures for food as reported by the United States Department of Commerce, because it does not include expenditures for seafoods; imported products such as coffee, tea, bananas, and pineapples; food consumed on farms where produced; and value of food bought by the Armed Forces. Differences in methods of estimating result in other variations between the two series.

[6] Market value and retail value of all civilian food, by various channels of distribution, for the years 1939 and 1948 were estimated by Marguerite C. Burk in an article, "Distribution of the Food Supply of the United States," published in this journal, July 1952. Miss Burk assisted in the development and interpretation of the market-value series used in this article.

[7] Data from this series for years 1940, 1945, and 1955 were used in MARKETING COSTS FOR FOOD. U. S. Dept. Agr. Misc. Pub. 708, Dec. 1955. See p. 11 of this pamphlet for a preliminary estimate of the effects of increased services, cost levels, and added volume in the increase in the marketing bill between 1940 and 1955.

TABLE 4.—*Value added by agriculture and by food processing as related to market value of farm food products, selected years, 1929–53*

Year	Market value of food	Agriculture		Food processing	
		Actual	Percentage of market value	Actual	Percentage of market value
	Billion dollars	*Billion dollars*	*Percent*	*Billion dollars*	*Percent*
1929	16.8	6.0	36	2.7	16
1933	10.7	2.9	27	1.8	16
1935	12.4	4.0	32	1.9	15
1939	13.5	4.1	30	2.5	18
1947	39.2	13.9	35	6.2	16
1949	41.2	12.9	30	6.5	16
1951	46.9	14.7	31	7.5	16
1953	49.4	13.8	28	8.4	17

materials, supplies, containers, and contract work from the value of products shipped." This statistic "provides the most satisfactory census measure of the relative importance of given industries * * *."[8] In the application of this concept to agriculture, value added measures the gross returns received by agriculture for its labor and capital, excluding the cost of production materials and other services furnished by the nonagricultural part of our economy.

Conceptually, consumer expenditures for farm food products can be divided into the different value-added components that represent the gross returns of each industry or group for its labor and capital. Some of the principal industries or groups would be agriculture, food processors, transportation agencies, wholesalers, retail food stores, and restaurants. Value added should give the most meaningful measurement of the distribution of the consumer's food dollar because it provides an unduplicated measurement of the gross returns received by various groups.[9]

Value added components for agriculture and food processors in selected census years from 1929 to 1953 are estimated in table 4. Value added by food processors was derived from statistics in the various Censuses of Manufactures, with deductions made for imported, nonfarm, and nonfood processed products, such as cocoa products, seafoods, and prepared animal feeds. Estimates of value added by agriculture in table 4 and those used to derive line C in figure 1 were obtained from estimates of gross national farm product (or value added by agriculture).[10]

As a proportion of the market value (or consumer expenditures) for farm food products, value added by food processing accounted for a relatively stable segment in the period from 1929 through 1953, varying from 15 to 18 percent, with no significant trend evident. Agriculture varied from 36 percent in 1929 to 27 percent in 1933, and from 35 percent in 1947 to 28 percent in 1953. The greater fluctuations in agriculture's share may reflect partly the relatively greater fluctuation in prices of farm products. Because value added is measured in terms of current dollars, the sharp decline in the percentage going to agriculture between the years 1929 and 1933 was caused primarily by the sharp decline in prices received by farmers relative to other prices in the economy. But some of the relative decline in agriculture's share between 1929 and 1953 reflects the increased importance of processed foods in that period.

Comparison of the Three Series

Let us now examine the trends in the farmer's share of the consumer's food dollar in figure 1 as measured by the three different series. The farmer's share of total consumer expenditures for farm food products (series B) has declined relative to the farmer's share for the market basket of food products (series A). One of the primary reasons for this difference in trend between the two series is the growing importance of consumer purchases of food products through marketing channels providing more services to the consumers which, therefore, adds to the cost per unit of food bought. This shift between marketing channels is reflected in the series B statistics but not in the market-basket statistics which measure the marketing margin and farmer's share for food products bought through one specific marketing outlet—the retail food store.

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[8] U. S. BUREAU OF THE CENSUS. ANNUAL SURVEY OF MANUFACTURES: 1953. Washington, D. C. U. S. Government Printing Office, 1955, pp. 10 and 11.

[9] The application of the value-added concept to production and marketing of agricultural products, food and nonfood, was discussed in an article, "The Marketing Bill for Agricultural Products," this journal, October 1955. Statistics on value-added components were estimated for the year 1954.

[10] A value-added statistic for the total agricultural industry was first published in 1951 by John W. Kendrick and Carl E. Jones in an article, "Gross National Farm Product in Constant Dollars, 1910–50," in the September 1951 issue of *Survey of Current Business.* These statistics have been revised and extended in later issues of the *Survey of Current Business.* Gross national farm product, excluding the gross rental value of farm homes, was adjusted for the proportion that farm marketings of food products (to which the statistics in table 3 relate) were of total farm output. This adjustment was derived from data on the utilization of farm products given in MEASURING THE SUPPLY AND UTILIZATION OF FARM COMMODITIES. Agricultural Handbook 91, U. S. Dept. Agri., Agr. Market Serv., Nov. 1955.

During the period 1929 through 1955, an increasing proportion of food has been bought through restaurants and other eating places. This trend was particularly marked during World War II, when many housewives entered the labor market and took jobs away from home. It was also during this period that the sharpest differences in the trends of the two series (A and B) took place. During low income periods, consumers are more likely to economize on amounts of marketing services bought with their foods and to make more purchases direct from farmer-producers, hucksters, wholesalers, or other groups that will minimize their cash outlays for food. Although statistical measurements of the importance of direct farm-to-consumer sales and other channels of distribution below the retail-store level are difficult to estimate for all food products, statistics are available on the proportion of fluid milk retailed by farmers. Between 1934 and 1954, for example, the proportion of all milk marketed by farmers that was sold direct to consumers declined from 10 percent to 3 percent.

Changes in the kinds of food bought and changes in marketing services associated with these shifts also affect the trends in the farmer's share of the consumer's food dollar as given by these two measurements. These shifts in the pattern of food purchases over a long period are reflected to some extent in the market-basket series because of periodic changes in weights. One factor not reflected in the market-basket series is the growing importance of the urban population which increases transportation and other services required. In general, urban consumers, with smaller families than formerly and with many wives employed away from home, tend to buy more processed foods and in smaller units than rural families.

Some of the effects on the farmer's share of consumers buying more processed and ready-prepared foods, which involve more marketing services, have been offset by the increasing importance of animal products which, in general, have a higher farmer's share than some of the other products. During recent years this has kept *trends* in the farmer's share from these two series (A and B) in closer relationship than might have been expected. For example, volume of products marketed for civilian consumption (weighted by 1947–49 average retail prices) indicates that total volume of bakery and cereal products has increased only slightly during the last 25 years, while volume of poultry and egg products has more than doubled. The farmer's share for bakery and cereal products is the lowest of any major product group; for poultry and eggs it is the highest.

In each of the individual food groups there has been a marked trend toward more processing and other services, but the rapid rise in marketings of poultry and eggs and the somewhat slower rise in all meat products have tended to reduce the overall impact of added marketing services in reducing the farmer's share. With available information, no completely satisfactory measurements or conclusions can be made concerning the overall effect of added marketing services. In many instances more marketing services may be provided at less cost to consumers because increased processing may result in marked economies in the transportation and distribution of the product.

The farmer's share of the consumer's food dollar as measured by series C—the value added by agriculture as a proportion of total consumer expenditures for farm food products—has declined in the period 1929–55 relative to measurements of both series A and B in figure 1. All of the factors discussed which affect the differences in marketing services between series A and B would also hold true in comparisons between series A and series C. The principal difference between series B and C is that the farmer's share is measured not in terms of farmers' cash receipts from sale of food products but in terms of their cash receipts minus cash farm expenditures for such items as motor fuels, fertilizers, and other purchased production supplies. These purchased production supplies have become increasingly important during this 25-year period. Therefore, the farmer's share of the consumer's food dollar as measured by value added has declined relative to the farmer's share as measured by any of the more usual comparisons of farm and retail prices or incomes and consumer food expenditures.

Each of the measurements in the three series of the farmer's share and the share of the marketing agencies (including any breakdowns that might be made according to agency or function) relates to gross returns, not net returns. Neither are they measurements of the equity of the share received by various groups. It is important to note that the farmer's share is as much a measurement of gross returns as are marketing agencies' shares. For example, the poultry producer's share of the consumer's egg dollar averages from three to four times as large as the wheat farmer's share of the consumer's bread dollar; but obviously this does not tell us anything about the relative profitableness of egg production versus wheat farming. It is true that the farmer's share, on the average, does tend to vary with the ups and downs of the parity ratio.

Trends in the farmer's share also are related to trends in net farm income. But, as shown in figure 1, trends in the farmer's share may be quite different if the full effect of changes in marketing services are considered. The wheat farmer's share of the consumer's dollar spent for products made from wheat may decline because consumers buy more bread and bakery products and less flour. Likewise, consumers may buy more eggs in the form of cake mixes and other processed and prepared foods, and less in the fresh form, with a resulting decline in the farmer's share of the consumer's dollar spent for eggs and egg products. In these examples the farmer's share may decline over time with no change in net returns to farmer-producers. However, the increased importance of processed foods may be beneficial in terms of providing more outlets for these farm products.

Value added provides the most satisfactory measurement conceptually of gross returns received by each industry or group concerned with the production, processing, and distribution of food. It is a "net" measurement in the sense that value added by any firm, industry, or group excludes the cost of materials and supplies furnished by other firms, industries, or groups. It is not, of course, a measurement of productivity or efficiency by itself. Inputs of labor and capital in each industry or group would have to be measured against its value added to provide suitable bases for comparing relative returns of various industries. One of the principal limitations of value added measurements is the difficulty of making computations on anything but a total industry approach. Value added for agricultural food production, and particularly for different commodity groups or individual products, is extremely difficult to compute with available data. In addition, the concept would not be easily understood by many users of the data.

The reader is cautioned that many of the statistics estimated for this article, particularly those for series B and C, are based on meager and inadequate data. The primary purpose of this article was not to come up with exact measurements but to explore and discuss various types of comparisons and analyses that might be made in the measurement of the farmer's share and related statistics. It is believed that the statistics computed for this article were adequate for these purposes. If the various measurements possible with series B and C are desirable, then more satisfactory data should be developed for these calculations.

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Per Capita Income by Economic Class of Farm, 1949

By Ernest W. Grove

This article presents newly developed national estimates of average income, per farm and per person in the farm family, for each economic class of farm in 1949. Aggregates and averages of farm income and expenditures are published regularly in considerable detail in The Farm Income Situation. Breakdowns are provided by regions and States and also in such terms as individual commodities and commodity groups, money and nonmoney income, and the various types of expenditures. But historical data by economic class of farm are not available to permit analyses of income trends on commercial farms on the one hand and noncommercial farms on the other. That is, estimates are for all farms in the United States, from the very small part-time and residential farms to the very large farms with sales valued at $100,000 or more.

AS THE BULK of the farm income, both gross and net, goes to those farms that are classified commercial, the published totals are sometimes used as representative of commercial farms. This is probably valid enough when year-to-year changes or short-period trends are under consideration. For periods of more than a few years, however, it is questionable whether the farm incomes of small and large farms move together.

In any event, the published averages of income per farm and income per person on farms are for all farms taken together, and they cannot be assumed to represent either the commercial or the noncommercial groups of farms. On many small farms, the farmer and his family are primarily dependent for a livelihood on income from nonagricultural sources rather than on farm income. Most commercial operators, however, not only have larger total incomes but receive the bulk of their income from farming operations. Thus, the overall averages of per farm and per capita income are actually combinations of income averages for more homogeneous subgroups of farms, among which both the absolute size and the relative importance of farm and nonfarm sources of income show wide variations.

For these reasons, a breakdown by economic class of the overall totals and averages of farm income is badly needed. It may be only fair to say that the income averages stand more in need of such a breakdown than do the totals from which they are derived.

The ultimate goal is annual series of income estimates for each economic class of farm, but these estimates could be provided only on the basis of regular and frequent surveys of farmers' income—and such surveys are expensive to conduct. Next best is a one-time report that would show income data in complete detail by economic class of farm. To date, income data by economic class of farm are available only for the year 1949. Data from the 1954 Census of Agriculture and from an Agricultural Marketing Service Survey of Farmers' Expenditures in 1955, when available, will provide additional information on the breakdown between commercial and noncommercial farms.

The published results[1] of the 1949 survey include per farm averages of money income for each economic class. They do not, however, allow for the differential effects of (1) survey understatement of farm income and (2) the distribution of nonmoney income, nor do they (3) combine the population and income data, both obtained in the survey, to provide estimates of per capita income by economic class of farm.

The purpose of this article may be restated: It is to fill the three gaps just mentioned, thereby enhancing the usefulness of the 1949 income data by economic class of farm. This is done, in the order indicated, in tables 1, 2, and 3. There follow descriptions of the contents of these tables and of their derivation and significance.

Allowance is made in table 1 for the understatement that appears to be inevitable in field surveys of income. The average net money income from the farm in 1949 is given, as reported, for each economic class in column 1. The estimated average amounts of understatement are shown in the second column. The first two columns are then added together to produce adjusted averages of net money income from the farm in the last column.

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[1] *Farms and Farm People—Population, Income and Housing Characteristics by Economic Class of Farm.* A Special Cooperative Study byt he U. S. Departments of Agriculture and Commerce. U. S. Govt. Print. Off., Washington, D. C., June 1953.

Table 2 shows the average income of farm-operator families by source of income for each economic class of farm in 1949. Starting with the adjusted average net money income from the farm in the left-hand column, as derived in table 1, the average rental value per farm dwelling unit and the average value of home-produced food and fuel are added in columns 2 and 3 to give realized net income per farm in column 4. The 1949 inventory decline is then subtracted in column 5, giving average total net income from the farm in column 6. Finally, off-farm sources of income in column 7 are included to provide estimates of the average total income from all sources in column 8.

In table 3, the data of table 2 are translated to a per capita basis after rearrangement in order to summarize all types of money income, farm and nonfarm, in the first three columns of the table, and to combine all types of nonmoney income in the next column. The averages in both tables are shown by economic class of farm as defined in the 1950 Census of Agriculture, but excluding the so-called "abnormal" farms, primarily institutional in character, to which family income data do not generally apply.

In addition to the usual combinations of "commercial" farms—classes I through VI—and "other" farms, including the part-time and residential categories, two summary groups are also shown under the headings "high-production" and "low-production" farms. The former covers classes I through IV, or all those farms for which the value of sales in 1949 was $2,500 or more. The latter includes classes V and VI commercial farms and all "other" farms—all farms from which the value of farm products sold in 1949 was below $2,500.

The per farm and per capita income averages here developed are based largely on 1950 Census data. More specifically, they are based on the matched sample of schedules from the 1950 Censuses of Population and Agriculture, the results of which were published 3 years ago in a report called *Farms and Farm People.*[2] The 1950 Census of Population and Housing obtained information on money income in 1949, as well as data on population and housing. By combining this with Census of Agriculture data, the matched sample produced tabulations of money income, population and housing characteristics for farm-operator families in relation to the economic classification of farms.

TABLE 1.—*Average net money income from the farm, with allowance for underreporting of income, by economic class of farm, 1949*

Economic class of farm	Average net money income as reported [1] (1)	Estimated average amount of understatement [2] (2)	Adjusted average net money income from farm [3] (3)
	Dollars	*Dollars*	*Dollars*
All farms	1, 577	248	1, 825
High-production (classes I–IV).	3, 061	616	3, 677
Low-production (all others).	592	3	595
Commercial farms	2, 076	351	2, 427
Class I	8, 880	5, 725	14, 605
Class II	4, 730	1, 153	5, 883
Class III	3, 030	305	3, 335
Class IV	1, 750	97	1, 847
Class V	980	11	991
Class VI	550	0	550
Other farms	385	0	385
Part-time	440	0	440
Residential	350	0	350

[1] From table 4, page 28, in *Farms and Farm People.*

[2] Average understatement for all farms, as derived from AMS control total, allocated by economic class in proportion to the average amount by which the calculated net value of farm products sold (from table 4, page 28, in *Farms and Farm People*) exceeds the reported average net money income of column (1).

[3] Sum of columns (1) and (2).

Methods of Estimation

The footnotes to the tables provide a summary description of the sources and methods used in preparing the estimates. A more detailed description follows.

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[2] Ibid. Chapters 3, 4, and 5 in this report, written by Ernest W. Grove, Helen R. White, and Barbara B. Reagan, respectively, provided the basic data by economic class of farm used in developing the income averages given in the tables.

TABLE 2.—*Average income of farm operator families, by source, by economic class of farm, 1949*

Economic class of farm	Adjusted average net money income from farm [1] (1)	Average rental value of farm dwelling [2] (2)	Average value of home consumed farm products [3] (3)	Average realized net income from farm [4] (4)	Average net decline in farm inventories [5] (5)	Average total net income from farm [6] (6)	Average income from off-farm sources [7] (7)	Average total income from all sources [8] (8)
	Dollars	*Dollars*	*Dollars*	*Dollars*	*Dollars*	*Dollars*	*Dollars*	*Dollars*
All farms	1, 825	236	308	2, 369	−148	2, 221	1, 075	3, 296
High-production (classes I–IV).	3, 677	295	383	4, 355	−328	4, 027	769	4, 796
Low-production (all others).	595	197	258	1, 050	−29	1, 021	1, 279	2, 300
Commercial farms	2, 427	250	351	3, 028	−206	2, 822	740	3, 562
Class I	14, 605	327	503	15, 435	−1, 949	13, 486	1, 320	14, 806
Class II	5, 883	327	410	6, 620	−533	6, 087	870	6, 957
Class III	3, 335	311	386	4, 032	−252	3, 780	670	4, 450
Class IV	1, 847	264	356	2, 467	−130	2, 337	750	3, 087
Class V	991	215	325	1, 531	−64	1, 467	920	2, 387
Class VI	550	161	288	999	−25	974	425	1, 399
Other farms	385	203	206	794	−10	784	1, 878	2, 662
Part-time	440	219	284	943	−22	921	1, 960	2, 881
Residential	350	193	155	698	−3	695	1, 825	2, 520

[1] From table 1.

[2] United States estimate allocated by economic class in proportion to the product of average number of rooms per farm dwelling unit and percentage of dwelling units not dilapidated, as given on page 74 of *Farms and Farm People.*

[3] United States estimate of total value of home consumption, minus value of wages in kind paid to hired farm workers, allocated by economic class in terms of the 1944 relationship between value of sales and value of home consumption.

[4] Sum of columns (1), (2), and (3).

[5] United States estimate allocated by economic class in proportion to the average value of farm products sold as given in table 4, page 28, of *Farms and Farm People.*

[6] Sum of columns (4) and (5).

[7] Adjusted average family cash income minus average net money income from farm, both as given in table 4, page 28, of *Farms and Farm People.*

[8] Sum of columns (6) and (7).

The reported averages of net money income per farm in column 1 of table 1 were taken directly from *Farms and Farm People.*[3] The problem of underreporting of farm income was discussed in that report, but adjustment was made only for the nonreporting of farm income. In other words, where the total farm family income had been reported with no farm income included, the reported family income was adjusted upward by an amount equal to the average farm income reported on farms of the same economic class. However, no attempt was made to adjust for understatement in reported farm incomes.

It was estimated in *Farms and Farm People* that underreporting of farm income totaled about 20 percent before the adjustment for nonreporting, and that it remained somewhere between 10 and 15 percent even after the adjustment. The problem in table 1 was to allow for this remaining understatement in farm incomes.

The allowance for understatement had to be based on the assumption that the official estimate of farm income published by the Department of Agriculture for 1949 represented the correct total. However, in deriving the 1949 control total for this purpose, the removal of nonmoney income, and other adjustments to provide conceptual comparability with the survey results, were only one of two steps required. The other necessary step was to allow for farms that were actually in existence in 1949, and were included in the total of farms used in deriving the national averages of income per farm in *The Farm Income Situation,* but which for one reason or another had been omitted from the census averages reported in *Farms and Farm People.*

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[3] Op. cit., table 4, page 28.

TABLE 3.—*Average per capita income of farm-operator families, by source, by economic class of farm, 1949* [1]

Economic class of farm	Net money income per capita from			Non-money income per capita [3]	Total income per capita from all sources
	Farm	Off-farm sources [2]	All sources		
	Dollars	*Dollars*	*Dollars*	*Dollars*	*Dollars*
All farms	449	265	714	97	811
High-production (classes I–IV)	889	186	1, 075	85	1, 160
Low-production (all others)	148	318	466	106	572
Commercial farms	598	182	780	97	877
Class I	3, 605	326	3, 931	−276	3, 655
Class II	1, 424	211	1, 635	49	1, 684
Class III	814	164	978	108	1, 086
Class IV	442	180	622	117	739
Class V	242	224	466	116	582
Class VI	145	112	257	112	369
Other farms	94	461	555	98	653
Part-time	108	480	588	118	706
Residential	86	448	534	85	619

[1] Based on the per-farm averages of income in table 2, the total numbers of farms as given on page 27 of *Farms and Farm People,* and the population in farm-operator households as given in *Farms and Farm People,* page 47.

[2] Includes income received from work and rents on farms other than the farm operated, in addition to income from strictly nonfarm sources.

[3] Includes the rental value of farm dwellings, the value of home-consumed farm products, and the net decline in farm inventories of crops and livestock which occurred during 1949.

In other words, the all-farm averages shown on the top lines of tables 1, 2, and 3 are not actually averages for all farms that were in existence in 1949. Instead, they are averages for all farms except (1) those farms in existence in 1949 which no longer existed as separate farms in 1950 because of consolidation or abandonment, and (2) those farms in existence in both 1949 and 1950 which were inadvertently missed in the 1950 Census of Agriculture. The 1949 income received by these farms omitted from the 1950 Census had to be removed from the 1949 control total of income before adjustments could be made for underreporting of income.

On the whole, approximately 340,000 farms were omitted from the 1950 Census because of the two factors just mentioned. It was assumed that these omitted farms had average net money incomes equal to the average for all reporting farms included in the low-production category (that is, with less than $2,500 in farm products sold). On this assumption, the income of the omitted farms was taken out of the control total before adjusting for underreporting on the remaining farms. The adjustment itself had very little effect in raising the reported average incomes for low-production farms, as most of it was in the incomes of high-production farms. Therefore, a series of successive approximations—theoretically required by this method of removing the income of omitted farms from the control total—was not actually necessary.

On the whole, understatement of 1949 farm incomes was relatively small. After the adjustment just described, it amounted to only 14 percent of the control total. Judging from previous experience with farm income surveys, however, understatement in the upper income brackets may have been relatively large. There was also some evidence in the 1949 data themselves that this was probably the case. Thus, a uniform upward adjustment of incomes of all the economic classes by 14 percent would not be a satisfactory allowance for underreporting of farm income. Rather, some method had to be devised whereby most of the understatement could be assigned to the higher value-of-sales classes.

Fortunately, *Farms and Farm People* provides a quite acceptable basis for such adjustment. The table that shows the reported averages of net money income from the farm also includes the "calculated net value of farm products sold per farm" for each economic class. This was obtained by subtracting the average expenditure per farm for the eight expenditure items reported in the 1950 Census of Agriculture from the average value of farm products sold. The result was a partially net figure for average farm money income that could be used as a check on the net incomes reported in the Census of Population. The discrepancies between these two independent sets of data were much greater in the higher than in the lower value-of-sales classes, so this "calculated net value of farm products sold" appeared to be tailormade for use in allowing for understatement of income.

The estimated class averages of understatement (column 2, table 1) are proportionate to the amounts by which the calculated net value of farm products sold per farm exceeded the reported average net money income in column 1. As the calculated net values were higher than reported income only for classes I–V, and were lower for all other economic classes, this method assigns all understatement of farm income to classes I–V. In fact, it assigns about two-fifths of the aggregate understatement to class I farms and about a third to class II farms. The remaining 27 percent of the total is distributed in rapidly diminishing amounts to classes III, IV, and V farms.

The averages of net money income from the farm, adjusted for understatement in the way just described, were transferred from table 1 to column 1, table 2. The per farm averages of nonfarm money income (column 7, table 2) were taken directly from the report on *Farms and Farm People.* The various categories of nonmoney income (columns 2, 3, and 5, table 2) represent Department of Agriculture official estimates for all farms in the United States, each adjusted to allow for omitted farms and then allocated by economic class in proportion to the most nearly applicable information available. The adjustments to nonmoney income for the omitted farms were based on the same assumption that was used in the case of net money income from the farm, which was that the average income for the omitted farms was equal to the average for all farms reporting sales of less than $2,500.

Finally, the per farm averages, table 2, were multiplied by the number of farms in each economic class. The resulting products were then divided by the population in farm-operator households, also as given by economic class in *Farms and Farm People*, to provide the per capita estimates (table 3).

The average rental value of farm dwellings (column 2, table 2) represents the published United States estimate for 1949 [4] adjusted for the omitted farms, then allocated by economic class in proportion to the product of (1) the average number of rooms per farm dwelling unit and (2) the percentage of farm dwelling units not dilapidated. This information was obtained in the 1950 Census of Housing and was related to the economic classification of farms in the matched sample that formed the basis for *Farms and Farm People.* It provides a reasonably satisfactory basis for allocation. The results indicate, as expected, a fairly uniform gradation in average rental value per farm from the high to the low value-of-sales classes.

The average value of home-consumed farm products (column 3, table 2) represents the published United States estimate of the total value of home consumption in 1949, less the value of perquisites received by hired farm workers in that year,[5] with the remainder, after adjustment for omitted farms, allocated by economic class in terms of the 1944 relationship between value of sales and value of home consumption. Farm-operator families do not consume all the unsold food and fuel produced on the farm. Some goes to hired laborers in the form of perquisites, and this part had to be removed from the total value of home consumption to give the value of products consumed by farm-operator families. Allocation of this remainder by economic class was based on the 1949 class averages of farm products sold and the 1944 regression of average value of home consumption on average value of sales.[6]

The value of home consumption is the only item in the tables for which the distribution by economic class is not based entirely on 1950 Census information. *Farms and Farm People* reported the percentages of farms in each class on which the various home food-production practices occurred, but it provided no information on their value. The percentages tended to increase from the lower to the higher value-of-sales classes up through class III farms, then to drop off somewhat in classes I and II. Data for previous Census years showed similar trends in the percentage incidence of home food production by value-of-sales classes. But they also showed conclusively that the average value of home consumption on farms reporting it increased a great deal more than enough to offset the drop in percentages reporting it in the highest value-of-sales brackets. For this reason, the 1950 data on percentage incidence of home food production practices were considered inadequate for the purpose, and 1945 data were used instead. However, a comparison of 1940 and 1945 Census data on value of home consumption related to value of sales indicates that the relationship is a highly stable one; so the estimates in column 3 of table 2 are probably about as reliable as those in any other column.

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[4] U. S. Agricultural Marketing Service. *The Farm Income Situation*, No. 155, October 1955, page 51.

[5] Ibid., pages 51 and 54.

[6] U. S. Bureau of the Census. 1945 CENSUS OF AGRICULTURE. SPECIAL REPORT ON FARMS AND FARM CHARACTERISTICS BY VALUE OF PRODUCTS. Table C. Page XXXIV.

No specific information is available with respect to crop and livestock inventories by economic class of farm. Consequently, the net decline in farm inventories for all farms taken together—as reported for 1949 in *The Farm Income Situation*[7]—had to be allocated by economic class, after adjustment for omitted farms, in direct proportion to the value of farm products sold. As might be expected, this method resulted in the allocation of a very substantial part of the inventory reduction to the higher value-of-sales classes. For example, the average net decline in farm inventories assumed for class I farms is $1,949, as compared with an average for all farms of only $148. But it is logical to assume that, in a year when farm inventories were reduced, most of the reduction occurred on farms that had the largest volume of sales. In fact, in the absence of any definite information on the subject, this method of allocation is the only acceptable one.

Evaluation of Results

The chief conclusion to be drawn from the income averages given in the tables is that low-production farms and low-income farm families are not necessarily one and the same thing. The right-hand columns of tables 2 and 3 show per farm and per capita averages of income from all sources and these are perhaps about as high as one might expect on the high-production farms. However, the estimates also indicate that the incomes of families on low-production farms are not excessively low on the average, except for Class VI commercial farms. Although income from the farm averaged fairly low for these low-production farms, on the whole, it was not quite so low as might have been expected. In addition, most of the low-production farm families received substantial income from nonfarm sources. The class VI group is a special case incomewise, having been so defined as to exclude all families who had any considerable income from either farm or nonfarm sources.

Two types of comparisons may be made in appraising the validity of these results. First, the all-farm averages of income in the tables may be checked with the official per farm and per capita averages for 1949, as published in *The Farm Income Situation.* Second, the per capita averages by economic class (table 3) may be compared with the only other estimates of this kind that have been published—a study of per capita farm income by economic class for the year 1944.[8]

Considering first the realized net income per farm, the average for all farms is $2,369 (table 2). This is $20 less than the national average of $2,389 for 1949 as published in *The Farm Income Situation.*[9] The latter figure is the higher of the two because it includes rent received from land rented to other farmers, whereas in table 2 such rent is counted under off-farm sources of income in column 7, and not under farm income in column 1 or 4. This more than offsets the assumption that farms omitted in the 1950 Census had below-average incomes in 1949. Net rent received by farmers from land rented to other farmers averaged approximately $93 per farm for all farms in 1949.

The per capita income estimates published in *The Farm Income Situation* are not an exact counterpart of those in table 3. Nevertheless, they are close enough to justify a comparison of the 1949 figures. Total income per capita from all sources in table 3 is $811 for all farms combined. The 1949 figure in *The Farm Income Situ-*

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[7] Op. cit., page 51.

[8] Brandow, G. E., and Allison, H. E. Per Capita Incomes on Commercial and Non-commercial Farms. Journ. Farm Econ. 33: 119–123, February 1951.

[9] Op. cit., page 46.

ation is $765.[10] The latter figure represents per capita income of the entire farm population, whereas the figure in table 3 is only for the population in farm-operator households—and only for that part that was still there in 1950.

The population in farm-operator households represented about 90 percent of the total farm population in 1949. The remaining 10 percent was probably made up chiefly of farm-laborer households and retired people. As the per capita income of this smaller group was undoubtedly below that for farm-operator households, per capita income of the latter should be higher than the overall average.

The total farm population declined by more than 3 percent from 1949 to 1950. It is reasonable to suppose, therefore, that about 3 percent of the 1949 farm population were persons in farm-operator households who were no longer there when the 1950 Census was taken. If the low-production figure of $572 in table 3 is taken as the correct average per capita income for this small group, and if the all-farm average of $811 in table 3 is taken as the correct average per capita income for the 87 percent of the 1949 farm population that was still in farm-operator households in 1950, and if the official figure of $765 is accepted as the overall average for the total 1949 farm population, then per capita income for the 10 percent of the farm population not in farm-operator households must have been about $423. This may be somewhere near the correct relationship.

It is evident that the estimates here presented tie in quite well with the official published estimates for all the Nation's farms and farm people. This is due partly to the adjustment of most components to official estimates. Nevertheless, it has some corroborative value. A further comparison with per capita incomes by economic class of farm as estimated by Brandow and Allison for the year 1944 can provide only a very rough sort of check because of significant changes in the economic classification of farms between the 1945 and 1950 Censuses of Agriculture.

The study by Brandow and Allison involved a detailed distribution of the Department's farm income and population totals for 1944 among seven economic classes of farms, relying mainly on the 1945 Sample Census of Agriculture. Most of their data had to be allocated rather arbitrarily by economic class in terms of the most relevant information that was available; and they had no basis for allocating income from nonfarm sources. In the present study, net money income from the farm and income from off-farm sources were reported directly by economic class, as were data on population in farm-operator households. As we have seen, arbitrary allocation by economic class in table 2 had to be resorted to only in the case of nonmoney income; and even there some fairly pertinent information was available.

The number of economic classes and their definitions were both changed in the 1950 Census of Agriculture, so that the 1944 and 1949 results are not strictly comparable. But despite some lack of comparability in the two sets of data, it is evident that the 1944 allocation resulted in assigning relatively lower per capita incomes to low-production farms than did the 1949 study. Probably this did not arise from any real shift in income relationships between 1944 and 1949. Rather, it may have come from the fact that low-production farmers reported considerably higher net cash farm incomes in the 1950 Census of Population than could reasonably be derived from the value of farm products sold reported in the Census of Agriculture.[11]

Some of the larger producers reported considerably lower net cash farm incomes than might reasonably be estimated from the value of the farm products they sold, but this was generally washed out by the adjustments made in table 1 for underreporting of income. As a result, 1949 per capita incomes on high-production farms appear to be fairly well in line with those shown by Brandow and Allison for 1944.

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[10] Op. cit., page 44.

[11] This discrepancy is discussed on page 29 of *Farms and Farm People.* The value of farm products sold was probably very substantially understated on low-production farms. The 1950 Census of Population obtained information on net cash farm income in response to a question which covered all types of self-employment income. Thus, a farm operator with a nonfarm business or profession was expected to report a single figure combining his farm and nonfarm business incomes. There may, therefore, be some nonfarm business income included with net money income from the farm in the first column of table 1. However, the number of such multiple proprietors reporting combined incomes must have been quite small, even in the part-time and residential groups, and the income involved was probably insignificant.

An important influence in reducing income differences among economic classes is the distribution of income from nonfarm sources. That is to say, farm families who have the lowest farm incomes are, by and large, those who get most of their incomes from nonfarm sources. The 1949 data, which showed income from nonfarm sources by economic class of farm for the first time, indicate that the average farm-operator family got 63 percent of its total money income from the farm and 37 percent from other sources. But if the data are broken down as between high- and low-production farms, we find that the high-production farm families received on the average more than four-fifths of their money income from the farm, and the low-production farm families received less than a third of their money income from the farms they operated. In actual dollars, the average net cash farm income from high-production farms was $3,677 in 1949, or more than 6 times as large as the average of $595 for low-production farms. In terms of total family income, however, the high-production average of $4,796 was only a little more than twice the low-production average of $2,300.

Thus, differences in the size of total farm family incomes are not nearly so great as differences in the size and productivity of farms might lead one to suspect. Nor were these differences generally increased by putting the averages on a per capita basis. In fact, the difference in average income between high- and low-production farms was reduced on a per capita basis, because the average size of farm-operator households was a little smaller on low-production than on high-production farms.[12]

These three factors—somewhat more favorable farm incomes than might have been assumed at the lower levels, a heavily skewed distribution of income from nonfarm sources, and a not disproportionate distribution of population—combine to produce the main conclusion of this report, which is, that the spread in average per capita incomes between high- and low-production farms is smaller than expected.

All this is not to deny the continued existence of some poverty in agriculture. There are many low-income farm families. But they are not necessarily all on low-production farms, and many of the families who live on low-production farms are not low-income families.

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[12] The income data of table 2 are for the *family*, although unrelated individuals who were farm operators are included as "single-person families." The population data used in deriving table 3 are for the *household*. On a majority of farms, the farm-operator family and the farm household are one and the same thing. On some farms, however, the household includes additional single individuals or secondary families. As income was not obtained for these additional people included in the population totals, it is evident that the per capita income averages of table 3 may be subject to some small degree of understatement. It is also likely that the discrepancy was relatively a little more important on large farms, particularly those in class I, than on small farms; so the larger average size of households on high-production farms may have been due entirely to a larger proportion of nonfamily members in the average household.

An Appraisal of Interview Procedures in Farm Surveys

By Raymond E. Vickery

As part of an expanded research program begun about 2 years ago by the Agricultural Estimates Division, Agricultural Marketing Service, pilot interview farm surveys were conducted in 10 Southern States during June 1954 and June 1955, and will be continued, in an effort to develop an improved crop and livestock estimating system. These surveys are somewhat unusual in that their main purpose is not to grind out estimates on a variety of agricultural items, but to study the operational and statistical problems that arise. Although emphasis is on research, the surveys are conducted under simulated operating conditions so that the transition from "research" to an operating program should be a natural development as the work progresses. This paper discusses technical aspects of the surveys.

DURING the last 15 to 20 years, the Agricultural Estimates Division, Agricultural Marketing Service, in common with other statistical agencies, has acquired considerable experience with modern sample survey techniques as they apply to interviewing samples of farmers and computing estimates from the data collected. Most of this experience was acquired as a byproduct in the main task of collecting data to be used in regular operating programs. The usual procedure in planning a survey is to make use of as much pertinent information as can be gleaned from previous surveys, together with a generous sprinkling of personal judgment, whenever a choice needs to be made between alternative approaches. However pleased one may be with the results after a survey is completed, one usually is left with the feeling that some things could have been done better. Little can be done about it until another survey is on the drawing board.

In a research project aimed specifically at developing procedures, the statistician has an opportunity to study the effectiveness of alternative techniques without regard to pressures imposed by an operating program. In particular, there is freedom from any feeling of compulsion to make estimates from the survey look as good as possible and to play down any deficiencies that might be detected.

At the time the first of the two surveys discussed in this report was in the planning stage, our statisticians were interested in several specific technical questions that had arisen in previous crop and livestock surveys. The type of sample under discussion was the familiar two-stage design involving (1) a stratified random sample of counties, selected with probabilities proportional to numbers of farms, and (2) a sample of small area segments selected in these sample counties. Farms were the units of observation and the subject matter of the questionnaire covered items on crop acreages and production, livestock inventories, and related data. From the statistical viewpoint, topics of major interest about which there was some uncertainty were related to:

1. Definition of a farm and farm operator.
2. Rules for associating sample farms with sample area segments.
3. Control of sampling errors.
4. Response errors in reported data.
5. The suitability of the farm as the unit of observation.

General considerations entering into the planning of surveys of this type are so well known that it is unnecessary to elaborate upon them here. Suffice it to say that the 1954 sample consisted of a sample of 100 counties in the 10-State region, stratified by type-of-farming areas within States and selected with probabilities proportional to 1950 census numbers of farms. Within these sample counties, a sample of 703 small area segments was selected at random for interviewing, with the sampling rate within each county set to give an expectation of 35 census (1950) farms. The survey was planned in the same way as any other survey of that kind would be planned in an operating program. The ground rules were drawn up in accordance with the most up-to-date information available which, in the opinion of experts of the kind usually consulted in such matters, should have resulted in a successful survey.

As indicated later in this paper, experiences in the survey were no different from those encountered in similar previous surveys—some ideas worked well, other not so well. Steps that were taken the following year to overcome the difficulties will be discussed simultaneously with the 1954 results.

Definition of a Farm and Farm Operator

Farm definitions have been troublesome ever since farm surveys of any kind were instituted; even now there is no unanimity of opinion as to a "best" definition. Perhaps there *is* no such animal; and the most the statistician can hope to do is to find the most appropriate definition for the particular subject-matter field in which he is working. For crop and livestock estimates, the most satisfactory definition appeared to be all land owned or managed by the operator, plus all land rented in, and minus all land rented out to tenants other than share-croppers. The decision to exclude croppers as separate farm operators was an effort to arrive at a farm definition that would correspond as closely as possible to farmers' own concepts of their farming operations.

That decision made it necessary to find a rigorous definition of "sharecropper." In this survey, sharecroppers were defined as persons who worked land in return for a share of the crop without furnishing their own tractor power or workstock. There was some argument against this definition because mere ownership of a mule would shift a person's classification out of the sharecropper category, even though his landlord regarded him as such. But the definition was retained for the very practical reason that it enabled interviewers to make clear-cut decisions as to how tenants should be classified. Attempts to define sharecroppers in terms of the degree of managerial responsibility exercised in the conduct of farming operations have proved troublesome in the past, because borderline instances in which decisions are difficult always arise.

Partnerships were treated by a rule that has proved satisfactory in the past. If both partners lived on the farm, or both lived away from the farm, the one that made the most decisions was considered to be the operator. If no such distinction could be made, the older partner was considered the operator. When only one of the partners lived on the farm, he was automatically considered to be the operator.

Managers were regarded as operators when they actually made all decisions on the day-to-day operations of the farm. When a manager had a farming operation of his own and, in addition, managed a farm for someone else, the two operations were regarded as separate farms, and the same person was listed as the operator in both instances.

In defining a farm as all land owned or managed by the operator, plus all land rented in, and minus all land rented out to tenants other than sharecroppers, it is also necessary to consider the scope of the agricultural operations.

Many rural "places" should not be regarded as "farms" if agricultural production is negligible or totally nonexistent. The rule adopted in 1954 was similar to one used in recent years by the Bureau of the Census—to classify a place as a farm if it scored 150 points on a rating system in which a specified number of points was assigned for each acre of a specified crop or group of crops and for each head of specified species of livestock. The number of points allowed for some items was greater on places of 3 acres or more than on places of less than 3 acres.

But the decision as to whether a place should be classified as a farm was not left to the interviewer. He was instructed to fill out a farm questionnaire whenever the "operator" of a place called the place a farm, and also whenever the operator did not consider the place a farm, if during the year, any poultry or livestock were kept or grazed, any fruit or vegetables were grown for sale, or any other crops were grown. The completed questionnaries were later reviewed by statisticians in Washington; questionnaries for all places not having enough points to qualify were discarded.

These definitions, with a few exceptions, worked well in 1954. Some interviewers complained that the concept of a sharecropper was too restrictive, but such comments were anticipated. For reasons already given, and in the light of experience with most of the instances encountered, the definition of a sharecropper was apparently as good as any that could be devised. Rules applying to partnerships also appeared to work well. Classification errors that occurred in 1954 were caused by failure of interviewers to follow instructions rather than by any deficiency in the rules.

The only serious difficulty in identifying farm operators occurred with managers. Whether a "manager" or his employer was classified as the operator of a given farm in the 1954 survey apparently depended largely upon which of the two happened to be interviewed. After the survey was completed, it was found in several instances that a manager had classified himself as an operator when his employer also considered himself in that category. Because of the difficulty of assessing the degree of responsibility actually exercised by self-styled managers, it was decided to modify the definition in the 1955 survey. Managers were not regarded as operators except when they had farming operations of their own on their own farms, in addition to "managing" farms for others. For farms with managers, the owners of the land were considered to be the operators in the 1955 survey. This approach appeared to work well. It will be retained in future surveys.

The definition of a farm did not always correspond to farmers' concepts of one. As in all such surveys, a few operators of small enterprises objected to being called farmers. This was no new experience and little can be done about it. Large operations with varied and complicated tenure arrangements were troublesome in the 1954 survey. But difficulties of this kind are related to problems of questionnaire construction rather than to farm definitions. They are discussed more fully in the section on response errors.

Associating Sample Farms With Sample Area Segments

When use is made of an area sampling procedure in which farms are the units of observation, rigorous rules are needed to determine which particular farms should be regarded as "in" the sample area segments. The usual practice in the past has been to establish a reference point on each farm in question. When that reference point was inside the segment, the farm was in the segment—when it was outside the segment, the farm was out of the segment. When the farm operator lived on the farm, his residence served as the reference point. When the operator did not live on the farm, one of the following, in the order given, was used as required to establish a comparable reference point:[1]

1. The most valuable dwelling on the farm.
2. The most valuable building on the farm.
3. The main entrance to the farm.
4. The northwest "corner" of the farm.

Although this procedure has been used in many previous surveys, it has always been troublesome in situations in which the operator did not live on his farm. Even ascertaining whether an operator lives on his farm is not always a simple matter if a farm consists of several noncontiguous tracts and if there is doubt as to whether the particular tract on which the operator's residence is located should be considered part of the farm. For each tract of land that falls wholly or partially within the boundaries of an area segment, the interviewer must remember or ascertain the answers to the following questions:

1. What constitutes a farm?
2. Is this tract all or part of a farm?
3. Who is the operator?
4. Does he live on his farm?
5. If the operator does not live on his farm, what land is included in the farm?
6. What point on the farm should be used as a reference point for sampling purposes?
7. Is that reference point inside the segment?

It is difficult to provide step-by-step instructions to interviewers in reaching decisions on such questions. Attempts to explain the problem to interviewers in such detail that they can do the necessary sleuthing, as the canvass of a sample area segment unfolds, and come up with right decisions have also been discouraging. Usually, such attempts have confused interviewers more than they have helped them.

In planning the June 1954 survey, it was decided to return to a device that has been used before, although not extensively enough to have given it a fair trial. This is to consider a farm as being in a segment whenever the operator's residence is inside the segment, regardless of where the land is located.

This procedure has both advantages and disadvantages over the other approach. The main advantages are that: (1) The interviewer can be given relatively simple instructions on how to proceed; and (2) the order of questioning respondents is the same in all instances—the whole process becomes more systematized and the likelihood of error is diminished.

The chief disadvantage is the increased diligence that must be exerted in ferreting out farm operators in the sample area segments in which such

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[1] See Brooks, Emerson M. A Report on the General Enumerative Surveys. Agricultural Economics Research. 5:37–48. 1949.

operators live if they do not live on their farms. In predominantly rural areas this is no serious problem because there a house-to-house canvass can be made without difficulty. Errors or shortages that occur in the open-country segments are therefore negligible in comparison with the errors and uncertainties experienced with the other approach.

But as many farm operators live in urban areas, the sample of segments must cover those areas as well as those in open country. Sampling urban areas at the same rate as those in open country in 1954 led to 25 sample segments falling in such areas. As these were heavily populated, a canvass of every household to search for farm operators was impracticable. Some shortcuts were introduced to solve the difficulty. These consisted mainly of a skip-house technique in which the interviewer asked members of a household if they knew anyone in the immediate neighborhood who might be a farm operator.

Such questioning made it possible to reduce the workload of canvassing households. It was necessary to contact households only when there was reason to believe that a farm operator lived there, or when neighbors were unable to give positive information about such a possibility. This was coupled with an "informed-person" approach in which county agents, local offices of other agricultural agencies, representatives of farmers' organizations, bankers, and feed and implement dealers were asked to supply names of people living in the segment who might be farm operators.

On the surface, this procedure appeared to work well enough, even though some subsampling of operators in urban areas had to be done in order to finish the job within the time allotted for the survey. In analyzing the 1954 data, it was assumed that coverage of operators was complete and that no "double" reporting had been done. Our 1955 results cast some doubt on the validity on the latter assumption that we avoided double reporting in 1954.

Because of the density of population in most urban segments, it seems desirable to reduce their size in future surveys and to include a proportionately larger number in the sample. This would serve to reduce the workload of each enumerator who had such a segment in his territory, and it would also reduce sampling errors. More farm operators than we expected live away from their farms. Also, they often tend to congregate in urban areas. Although the 25 urban sample segments in 1954 represented only 3.6 percent of the total, they accounted for about 15 percent of the total number of farm operators picked up in the survey. Several of the urban sample segments picked up very large numbers of operators, often of large farms.

In a refinement made in 1955, instead of 25 sample segments in urban areas, we selected 79; and their size was made proportionately smaller so that the overall sampling rate was the same as before. This revision in the number and size of urban segments produced some rather marked changes in the urban portion of the sample from 1954 to 1955. First, only about half as much cotton and corn was picked up in these segments in 1955 as in 1954. The number of operators in urban segments also declined sharply in comparison with those in rural segments. Table 1 shows the comparison.

TABLE 1.—*Number of farm operators in urban and rural segments*

Item	1954	1955	1955/1954
	Number	*Number*	*Percent*
Urban segments	437	336	76. 9
Rural segments	2, 438	2, 347	96. 4

In retrospect, it looks very much as though operators were overcounted in 1954. Furthermore, in subsampling the highly congested areas, more than the right proportion of large operators appear to have been picked up, thus causing an overexpansion in the reported data. Double reporting, in the form of nonresident operators and managers or tenants claiming the same land, no doubt added to the suspected bias in this part of the sample.

Control of Sampling Errors

Considerable information as to the magnitude of the sampling errors likely to be encountered is available from past surveys. One purpose of a research study on sample survey techniques is to devise ways and means of reducing the effects of such errors. One control that was exercised in the 1954 survey was the device of stratifying counties by farm type in the selection of sample counties within States. There was nothing new about that particular technique. In the survey, it became apparent that a fairly large portion of the within-county variability was contributed by a few urban sample segments which contained large numbers of farm operators. The occasional large farms that were picked up also contributed their usual disproportionately large share toward the overall sampling errors.

It was anticipated that reducing the size of urban sample segments and increasing their number would cause some reduction in within-county variability in 1955. It was also thought that the introduction of a supplemental list of large farms, which would be interviewed independently of the area sample, would effect a further reduction in error. For this reason, a supplemental list of 1,000 large farms was selected for interview in the 100 sample counties.

The list of 1,000 was selected from a total list of about 3,000, obtained chiefly from county Agricultural Stabilization and Conservation (ASC) offices. The list presumably included all farms of 1,000 or more acres of farmland, except for several counties in Texas where the size limit was 2,000 acres. Farms on the list not chosen for enumeration as "large" farms reverted to the "other" farm category and were enumerated only if the operator lived within the area sample.

Allocation of the thousand large farms to the sample counties was made in such a way that counties that carried a heavy weight in the estimate for the entire region were more heavily represented. The proportion of cropland included in the large farms present in the counties also was taken into account. Considerable judgment was exercised in selecting farms for interview from the list of all large farms present in the county. An attempt was made to choose farms that appeared to be intensively cultivated so that most of the improvement in the resulting estimates would relate to crop acreages and production.

Preliminary analyses of 1955 data indicate that in most instances these attempts to reduce sampling errors were rather effective. The list of large farms reduced sampling errors for practically all items. But, strangely enough, improvement in sampling error of cotton acreage was rather small. Apparently, livestock numbers and acreage and production data for crops other than cotton are more highly correlated with size of farm than cotton acreage and production. The use of smaller-sized urban sample segments further reduced sampling errors considerably on most items. It appears that for some items the breaking up of urban segments into smaller units, which permitted more careful and complete canvass, was more effective as a device for reducing sampling errors than the introduction of the large-farm list. Sampling errors for some major items in the two enumerative surveys are given in table 2.

Table 2.—*Sampling errors for selected items*

Item	Unit	June 1954 error	June 1955 error
		Percent	*Percent*
Cotton planted	Acres	14. 3	13. 7
Corn planted	Acres	8. 9	7. 3
Cattle, all	Number	11. 3	8. 9
Hogs, all	Number	13. 5	9. 4

Response Errors in Reported Data

Response errors usually encountered in interview surveys are of several kinds. One type relates to such things as omission of eligible farms or inclusion of ineligible farms and failure of interviewers to pay proper attention to the particular farm unit to which answers to individual questions on crops and livestock should apply.

Another type of error arises from misunderstanding of questions by individual farmers or from inability of respondents to supply exact information. In the 1954 survey, a few instances of ineligible farms were included. Some eligible farms may have been excluded. But the largest source of error appeared to be a failure of replies to questions on crops to apply to the particular farm unit specified by the definition. This was particularly noticeable for crops frequently grown on shares when a farmer had a number of tenants who paid a share of the crop for rent. Apparently, operations of such tenants were properly excluded from the farming unit by the interviewer when recording total farmland, but when farmers reported on their individual crops they frequently tended to include crops grown by share tenants along with their own operations.

This stemmed from the well-known fact that farmers often consider crops grown by some types of tenants as under their own control, even though the interviewer classified the tenants themselves as independent operators. Every effort had been made in designing the questionnaire to restrict each farmer's report to the land that was defined early in the questionnaire as his own operation, but it was evident from an examination of the resulting data that these efforts were not completely successful in 1954.

To overcome the difficulty, an entirely different approach was employed in 1955. Early in the questionnaire, the farmer was asked whether he rented any land out. If he answered "yes," he was asked if he could supply information on those tenants' operations. Land for which the farmer could not report was deducted from total land owned plus land rented in. This was established as the operating unit. In most instances, the farmer stated that he could supply all the information requested. He was then asked to report information on the established operating unit as a whole. After this was done, the farmer was asked to report for each tenant, other than croppers, individually. Information on sharecroppers was obtained for the group as a whole, as they were not classed as operators. After he had reported information for the individual tenants and for sharecroppers, he was asked whether or not all the items reported for these tenants had also been included in data he had reported for his own operation, and if not, what items were omitted.

By having all of this information on the questionnaire, it was possible later to list the data in the office in such a way that data on crops and livestock could be properly allomated to the farmer's own operations and the operations of his tenants. This was not too difficult, and it provided a workable solution to a long-standing difficulty. Some farmers may not have supplied information for their tenants as accurately as they believed they had, but possible errors in reporting appeared to be small in relation to duplications that occurred when this device was not used in 1954.

In several instances, tenants farmed land owned by more than one landlord, or had other farming operations of their own in addition to being tenants of the particular landlord interviewed. When that happened, it was necessary to visit the tenant, if he lived in the segment, to get the information for his entire operation. In this situation, the information supplied by the landlord who was interviewed was used mainly to make sure that appropriate deductions were made so that the landlord's own operation was covered properly.

In the 1954 survey, an attempt was made to gain some information about the way in which farmers interpret some questions that appear on other questionnaires used by the Agricultural Estimates Division. One of these related to the farmer's interpretation of the question on "pigs saved." It was suspected that farmers who sold or gave away pigs from litters might not regard them as "saved." Probing questions in the 1954 survey reveal that the total number of "pigs saved" was reported about 3 percent too low, because some farmers omit pigs that are sold or given away.

A number of questions was asked in an attempt to discover whether or not farmers report yield and production of corn in standard units as called for in the questionnaires. It was found that, although the units in which yield and production were reported varied from one part of the region to another, farmers apparently were aware of the number of standard bushels represented by such units. In most instances, production was reported in units that can easily be converted to standard bushels. In a few instances, farmers apparently had no concept of what constitutes a standard bushel.

Another series of questions was devoted to learning whether oats cut and fed unthreshed should logically be classified as "grain" or "hay." It was found that oats cut and fed unthreshed were largely in the mature category. These questions were pursued no further in 1955.

It is believed that there may be important differences in the way farmers report acreages of individual crops. Apparently this is due to differences in concepts of what to include in reporting acreage of a crop. Allotment crops are believed to be reported more nearly on a cultivated area basis and—excluding such areas as fencerows and bare spots—nonallotment crops on a total field basis. There is some evidence to support this belief. Careful studies on 200 fields distributed equally among cotton, corn, sorghum, and soybeans showed that reported cotton acreages agreed closely with cultivated areas. Reported acreages of the other three crops had a tendency to exceed even the total measured field size.

Suitability of the Farm as a Unit of Observation

One suggestion offered in connection with discussions on the control of response errors was that a "closed-segment" approach might be invoked as a quality check on the enumeration of farms. This involves taking an inventory of crop acreages and livestock numbers and related data for all tracts of land within the boundaries of selected sample segments, without regard to the particular farms with which these tracts are associated.

Some experience with such an approach, as it applies to estimating crop acreages, is available in the United States. It is the accepted practice in most foreign countries that use objective methods in sampling for crops. Although the success with which it could be applied in estimating other items was questioned, our tests indicated that it might yield more accurate results than the farm approach.

The advantages of the "closed-segment" approach are self-evident. Difficulties with farm definitions are avoided and sampling errors are reduced because effects of variation in size of farms are eliminated. It also makes it possible to verify reported land use data by direct measurement with less difficulty than would be experienced if such verification were to be applied to data covering entire farms. With large-scale aerial photographs of selected sample segments available, all land involved in the canvass of the segments can be delineated on such photographs. This is not always the case when farms are the units of observation. The selection of sample fields for objective yield data is also simplified.

For the June 1955 survey, about 100 segments were selected in 85 additional counties to do experimental work on this subject. The results have fully met expectations—so much so that in future surveys for the collection of crop and livestock data, this approach will be recommended by our research staff. Interviewers were enthusiastic because of the simplicity of the instructions and the ease with which field operations can be conducted.

From the statistical viewpoint, the reduction in sampling errors is gratifying. One closed segment appears to be the equivalent of at least two segments using the farm approach, and for some items the superiority is even more marked. The verification of reported data on crop acreages is greatly simplified. It appears that data such as livestock numbers, stocks of agricultural commodities, and other agricultural items in addition to crop acreages, can be collected by this method just as conveniently as with the farm approach.

In the initial test, there were indications of an upward bias in the livestock data. Some livestock were discovered to have been reported inside the segment when they were actually outside. But with additional experience and care in the fieldwork such biases should be eliminated. There is some evidence that data on livestock numbers obtained with the closed-segment approach may eventually prove to be more accurate than that obtained with the farm approach; farmers who respond for closed segments report only numbers within the boundaries of the sample segments; they do not need to disclose all their holdings.

One interesting observation relates to the corn acreage picked up by this approach. Apparently more corn acreage is reported when the inventory is on a segment basis than when the farm is the unit of observation. This apparently is caused by attention being directed to many small patches not intended for grain that may be overlooked or disregarded by the farmer when he reports for his farm as a whole. The fact that most of this corn is not intended for grain makes this hypothesis all the more reasonable. Total acreages on corn for *grain*, as recorded in the "closed segment" approach corresponded rather closely with total acreages of corn for *grain* obtained from data reported for entire farms.

Currently the Agriculture Estimates Division is considering plans for farm surveys to be conducted during the 1956 crop season. It is likely that the "closed-segment" approach will be used in all segments in the June 1956 survey, with livestock items obtained for the whole farm as well.

Book Reviews

Can We Solve the Farm Problem? By Murray R. Benedict. The Twentieth Century Fund. New York. 601 pages. 1955. $3.00.

"THE MOST URGENT PROBLEM before us now is to establish a sound basis for continuing progress in dealing with the longer-term problems in agriculture. * * * If that can be done, there is reason for confidence * * * that reasonably adequate solutions will eventually be found for most of the farm problems that now concern us." (pp. 528–529.) This is the answer supplied in this 600-page volume to the question raised in its title.

The book consists of two distinct parts: (1) A scholarly, well-documented and "comprehensive study of the Government's farm programs" by Professor Benedict (with the counsel of Dr. O. C. Stine), covering the first 480 pages, and (2) the report of a committee of 12 selected by the 20th Century Fund to review Benedict's analysis and "formulate recommendations for public action."

Even though all the members signed the committee report, Harry B. Caldwell (Master of the North Carolina State Grange), and Donald R. Murphy (Editor, *Wallace's Farmer and Iowa Homestead*), found it necessary to file a supplementary statement that is really in the nature of a dissenting opinion, and other members found it necessary to sprinkle dissenting footnotes throughout the report. The committee as a whole makes the standard criticisms about past administration of price-support programs—especially those relating to the level and method of price support. Caldwell's and Murphy's dissenting statement, while agreeing that the committee report makes some "admirable suggestions about shifts in farm policy," nevertheless asserts that "it fails to come to grips with the major issue." They hold that the committee report lacks any "realistic sense of the immediate pressure of farm surpluses. * * *"

Professor Benedict's analysis is well done. In my judgment, however, he defines "the farm problem" a bit loosely as "the whole array of grievances and aspirations that cause farmers to seek Government aid in achieving ends they consider appropriate and desirable." Nevertheless, the book should be most useful to anyone, including students of agricultural economics, in need of a comprehensive and systematic account of the major types of efforts that have been made to help the farmers. The author is to be especially commended for frankly and clearly admitting his own predilections for what he calls a "free-enterprise" economy. It would be most interesting to know what Dr. Stine's "counsel" was. Perhaps this will become apparent upon the release of a second book now being prepared by these two authors which deals in greater detail with the various commodity programs.

In 8 chapters of the present volume Professor Benedict discusses most of the activities of Government in the agricultural field, both orthodox or accepted, and unorthodox or controversial activities—from research to the Commodity Credit Corporation. In his final chapter he summarizes the weaknesses of past price-support programs in much the same way as the committee whose report his work precedes. He presents the Department of Agriculture's estimate of the total cost of all "agricultural and related" programs from 1932–53—the total being about 17 billions, only 7½ billions of which was for price and income supports. This difference between the cost of price and income supports versus all agricultural activities needs to be clearly recognized.

Two appendices complete the volume. Appendix A is a discussion of "The Parity Concept and Its Relation to the Farm Problem." The history and evolution of the legal definitions, as well as an economist's analysis of their weaknesses, is included. Appendix B contains the details of the "U. S. Department of Agriculture Computation of Cost of Farm Programs, 1932–1953."

Bushrod W. Allin

The Language of Social Research: A Reader in the Methodology of Social Research. Edited by Paul F. Lazarsfeld and Morris Rosenberg. The Free Press, Glencoe, Illinois. 590 pages. 1955. $6.75.

IF THIS BE THE LANGUAGE of social research then teach me, please, a simpler tongue. One of the more obscure passages in this reader in the methodology of the social sciences has already been the source of comment by the *New Yorker*, and even the most technically trained specialist in social science research will experience little difficulty in identifying other parts of the volume that defy comprehension.

This suggests one of three caveats that need to be brought to the attention of the unwary reader who may be deceived by the gloriously exaggerated title of the book, namely, that it is not a self-sufficient volume. It may be useful as a teaching tool, but many of the selections are meaningless and/or difficult to comprehend by virtue of having been taken out of their specific research context. Guidance, preferably by someone trained in the Columbia University Bureau of Applied Social Research, is, in many instances, imperative.

The other two warnings are: (1) This is not a "how-to" book. At one point the editors draw a sharp distinction between the methodologist and the technician, and insist that they are not providing guidance on *how* to do research. Thus, one canot use this reader as a manual on research methods. (2) It is not representative of the current status of social science methodology but reflects the personal interests of the editors and their collaborators. For example, only the barest minimum of attention is given to studies in economics. The narrowness of perspective becomes evident when one compares the contents of this reader with those of the excellent case-book on methods in social research edited by Stuart Rice almost a quarter century ago.

Despite these limitations, the editors perform a useful function in assembling for teacher, student, and practitioner many valuable source materials that would not otherwise be readily available. In addition, they provide a systematic codification of selected areas of social science methodology. The 64 selections, drawn from research reports, articles, essays, and unpublished sources, are organized into six sections dealing with (1) concepts and indices; (2) multivariate analysis; (3) analysis of change through time; (4) formal aspects of research on human groups; (5) the empirical analysis of action; and (6) selected problems in the philosophy of the social sciences. Each section includes a brief introductory essay. These introductions supply some coherence to the individual selections, explain their inclusion in the volume, and offer suggestions to teachers.

The absence of an index considerably reduces the effectiveness of this reader as a reference work.

In view of the pressing demands for better interpretation of the results of social research, the editors are to be congratulated for their persistent attention to problems and procedures of *analysis* of social data. But, their belief that such analysis can proceed on the assumption that the data have been "properly collected" (p. 5) is naive and begs a significant question.

Harry Alpert

The Agricultural Economy of the Danubian Countries, 1935–45. By S. D. Zagoroff, Jeno Vegh, and Alexander D. Bilimovich. Food Research Institute of Stanford University. Stanford University Press. 479 pages. 1955. $7.50.

AT THE OUTSET Dr. Zagoroff writes that insufficient wartime and post-war information for some of the areas made impossible a fully integrated generalization of the studies devoted to Hungary, Rumania, Yugoslavia, and Bulgaria—the four countries whose economies are examined in this volume. Nonetheless, his introductory "General Survey of the Agricultural Economy of the Danubian Countries, 1935–45" is a careful and lucid presentation of far-reaching changes, in a complex area, during the chaotic period of transition from independence to satellite status via Axis war economy. And for Western students, this study, together with the four papers by area specialists, will be an indispensable starting point for understanding the nature and extent of changes brought about by communism in the agricultural part of Eastern Europe.

Zagoroff's survey begins with physical conditions, and explores, in turn, position and organization of agriculture, and food balance. The four countries of Danubia have a total area slightly larger than Texas, with a population of some 50,000,000. This is a population density comparable to that of Illinois or Ohio. Only in Hungary was the net product of manufacturing and construction larger than the net product of agriculture, and the labor force employed in non-agricultural pursuits greater than that in agriculture.

The labor force in agriculture in Danubia in pre-World War II was nearly double that of the United States, but net value of U. S. agricultural output was about 4.5 times greater.

Organization of agriculture, in all four countries, reflected, in varying degree, the progress of land reforms having for their aim the century-old ideal of the Danubian peasant—the direct exploitation of land. This vigorous process, heralding a happier rural society in one of the most underprivileged areas of Europe, was reversed as a result of the Communist takeover.

Because of the lack of statistical data for the war years, food balance of Danubia is approached by Zagoroff on new lines. He overcomes the handicap by relating the food balance to crop production.

Each of the four regional papers that form the body of the book differs widely in emphasis and comprehensiveness, and each is limited by the availability of published statistical data for the respective countries.

In the case of Hungary, Jeno Vegh stops at the threshold of the post-war period. He devotes much attention to evaluating the land reform measures here, and concludes that they did not go far enough in relieving the pressure of population on land. In his view, Hungary's agriculture, because of its natural position and possibilities, will continue to play an important role in the Hungarian economic life in spite of any trend toward a forced industrialization.

The study of Rumanian agriculture, by an anonymous contributor, is severely handicapped by the paucity of statistical information in a country which, since the Balkan war of 1913, has been subjected to large-scale devastations, military occupation, and extensive boundary changes. Despite these serious difficulties, Rumania succeeded in developing a prosperous agricultural economy based on peasant ownership of land. When, in 1949, the National Assembly of Rumanian Peoples Republic ratified a decree giving the state the right to expropriate land for state farms, and, in the same year, initiated collectivization, a new, sad era for the Rumanian peasantry began.

Before the war, Yugoslavia, most rural of all Danubian countries, was plagued by rural overpopulation and extreme splitting-up of peasant property. In World War II, Yugoslavia was invaded by the Axis powers with unprecedented devastation. The vast job of reconstruction, with the help of UNRRA, is described by Prof. A. D. Bilimovich in considerable detail, in a separate chapter.

Making excellent use of ample documentation available to him in form of the agricultural census of 1926, 1934, and 1946, Zagoroff digs deeply within a narrowly delimited scope. Bulgaria's problem during World War II was feeding the cities and maintaining a decent price structure. A land with no "agrarian problem"—and virtually no landless peasants—Bulgaria, on the eve of World War II, was successful in intensifying its agriculture. Its two great difficulties have been lag of livestock production behind population growth, and rapid fragmentation of farm holdings. The livestock problem, greatly augmented by phenomena accompanying forced collectivization, is still bedeviling the Red regime. And to the Bulgarian peasant, collectivization is most emphatically the least acceptable solution of the problem of fragmentation.

Eugene V. Prostov

Industrial and Commercial Geography. Fourth Edition. By J. Russell Smith, M. Ogden Phillips, and Thomas R. Smith. Henry Holt and Co., New York. 689 pages. 1955. $6.95.

Regional Geography of the World. By Jesse H. Wheeler, Jr., J. Trenton Kostbade, and Richard S. Thoman. Henry Holt and Co., New York. 628 pages. 1955. $6.50.

World Economic Geography. By Earl B. Shaw. John Wiley and Sons, Inc., New York. 582 pages. 1955. $6.50.

STUDIES made by economic geographers overlap the research carried on by agricultural economists. Workers in these two fields use the same basic information but ordinarily they use different approaches in presentation and analysis. Three recent books that deal with economic and regional geography are therefore of interest to economists. Although these books are intended primarily for college students, the geographical evaluation of world economic conditions will be of interest to more advanced researchers.

The fourth edition of *Industrial and Commercial Geography* is a thorough reorganization and revision of a book that has been popular in the field of economic geography since the appearance of the first edition in 1913. The commodity approach is used in the discussion of world agricultural resources. Countries are discussed in terms of two worlds—the world of highly developed countries and the world of underdeveloped countries. In the organization of the book, 4 background chapters are followed by 9 chapters which deal with agricultural commodities, 1 chapter on fishing, 16 on manufacturing and mining, and 7 on trade and transportation. The last chapter, "Retrospect and Prospect," gives a stimulating summary of what the authors call the "Scientific Revolution" in sanitation, industry, and communications.

Footnotes are used extensively to give the sources of information. There is no bibliography. Illustrations, maps, and charts are well chosen and numerous. With few exceptions, each tells a story or raises a question. The graphic and photographic presentation closely supports the text and the journalistic style of the book makes it an absorbing example of economic geography.

Regional Geography of the World gives a good general survey of the "basic ideas and supporting facts about contemporary world geography which a person with a college education might reasonably be expected to know." Eight world regions comprise the framework for discussion. These are: Europe, the Soviet Union, the Middle East, the Orient, the Pacific World, Africa, Latin America, and Anglo America.

The first part of the book, which presents some introductory concepts in geography, will help the reader to appreciate the unique characteristic of geography as a subject which centers attention on the "study and interpretation of particular areas in the world."

The graphic presentation and illustrations add much to the value of the book in the hands of a reader who has little or no previous geographical training.

World Economic Geography emphasizes principles. The commodity, regional, activity, and principles approaches are illustrated. Major emphasis is on agricultural phases of economic geography. World agricultural production is discussed by eight major climatic regions.

Because of the stress placed on the study of principles, the author found it necessary to sacrifice a comprehensive survey of the agriculture of the different regions. Comparatively little attention is given to the industrial and commercial aspects of economic geography. More striking illustrations and graphics would improve the usefulness of the book.

James R. Anderson

The Analysis of Family Budgets. [With an Application to Two British Surveys Conducted in 1937–9 and Their Detailed Results.] By S. J. Prais and H. S. Houthakker. University of Cambridge, Department of Applied Economics. Monograph 4. New York: Cambridge University Press. 1955. 372 pages. $9.00.

OCCASIONALLY in a murder mystery, the reader may prefer to start with the first corpse, finish the book, and then go back to the beginning to pick up some preliminary details. A similar approach to this book is recommended. Most readers will find Part II, entitled "The Analysis," of much greater interest than Part I, "The Material and the Tools." Moreover, many of the tools used directly in the application are described in Part II, whereas some of those described in Part I appear too nebulous to have much practical value. Part III consists chiefly of 187 pages of detailed tables of small interest to most readers.

Although the number of workers who are willing to part with $9 to obtain the 92 pages contained in Part II may be limited, it is to be hoped that wide use will be made of available copies in libraries and other institutions, plus those sent to reviewers. This part should be carefully studied by all research workers who have an active interest in the analysis of family budget data. It is by far the most comprehensive and detailed recent discussion of methodology in this area with which I am familiar. Moreover, the methods developed are applied in each instance directly to the two surveys analyzed. Thus, the reader not only can follow the exact reasoning used in developing the methods, but also can see and appraise the results. Nineteen exceedingly helpful graphs are included.

The studies discussed are based exclusively on cross-section data. The justification for so thorough an analysis of data relating to the late 1930's is that the classifications and cross-classifications that could be made from these two surveys are unusually complete, so that many facets of consumer behavior could be investigated. The primary purpose of the study was to explore alternative methods of analysis and to develop new approaches, but the conclusions reached with respect to consumer behavior have considerable value. Mathematical notations of a rather advanced type are used in many places, but in general the rationale and conclusions are presented in nonmathematical terms, frequently with helpful graphic illustrations.

A sort of iterative approach is described in Part II, although iterations are not carried much beyond first approximations. In dealing with the measurement of Engel curves, the assumption is made that differences in household size can be allowed for approximately by converting data on expenditures for individual commodity groups and total expenditures to a per capita basis. Sound arguments are presented for using expenditures for individual items rather than quantities as the dependent variable, and for using total expenditures instead of total income as the independent variable. In the empirical fitting process, several types of curves are tested before choosing a standard type.

In measurement of quality variations in consumption among income groups, where variations in quality are measured by variations in price paid per unit, the authors define quality elasticity with respect to income in terms of expenditure elasticity equalling the sum of the quantity and quality elasticities. Consideration is given to the question of whether, as income increases, consumers not only use better qualities of each kind but also purchase more expensive types.

The authors next consider development of unit-consumer scales that can be used to allow for the multiplicity of combinations of adults and children that make up an individual household. They give careful discussion of the theory of scales of equivalences and of alternative approaches to the problem. In this section, the authors rely rather heavily on mathematics to illustrate various relationships, and I found their discussion more difficult to follow than in earlier chapters. They conclude that a valid analysis of the effects of household composition can be carried out only if the effect of both income and household composition are studied simultaneously. As some of the relations are curvilinear, an iterative procedure for doing this was developed, but this procedure is practical only when one has access to an electronic computer.

A discussion of economies of scale in consumption is rather difficult to follow. The basic conclusion reached is "that of two households with the same level of income per person, the larger household will, as a result of economies of scale, enjoy a standard of living which is higher by 13 percent of the ratio of their sizes; the standard of living is here measured in terms of the quality of food bought."

The effect of social class, occupation of wage earners, and geographical location, on patterns of consumption is discussed, and the entire study is briefly summarized, with suggestions of some implications for further research. These chiefly involve the use of results from each segment of the study to refine the results from other segments.

Going back to Part I, we find a brief and highly mathematical discussion of the theory of consumers' demand, a rather elementary discussion of problems involved in collecting budget data and their limitations, a highly mathematical consideration of some special problems involved in the estimation of statistical relationships, and a discussion of computational methods, with emphasis on the alternative roles of desk calculators, punched-card equipment, and electronic computors.

Richard J. Foote

Selected Recent Research Publications in Agricultural Economics Issued by the United States Department of Agriculture and Cooperatively by the State Colleges[1]

BAILL, I. M. THE FARMER AND OLD-AGE SECURITY. A SUMMARY ANALYSIS OF FOUR STUDIES, 1951–54. U. S. Dept. Agr., Agr. Inform. Bull. 151, 43 pp., illus. December 1955.

Most farm operators had not accumulated sufficient capital assets to provide for their economic security in old age. In 3 of the 5 farming areas surveyed, more than half of the farmers had less than $10,000 estimated net worth. Regular farm workers were less prepared than farm operators to provide for their own living in old age. More than half of the regular farm workers interviewed had no assets other than an automobile or truck.

BELL, HUGH P. PREFERENCES FOR CANNED GRAPEFRUIT JUICES. U. S. Dept. Agr. Mktg. Res. Rept. 108, 31 pp., illus. December 1955. (RMA)

One of the most important characteristics of canned grapefruit juice, and believed most likely to influence consumer reactions, is the tart-sweet characteristic. To determine the tart-sweet level most preferred, researchers tested both natural favored and sweetened juices in four degrees of varying sweetness. The respondents preferred the sweetened juices to the unsweetened ones.

BRANSON, ROBERT E., JACOBS, MILTON, AND HALL, RICHARD. FROZEN GRAPEFRUIT SECTIONS: EVALUATING A NEW PRODUCT BY RETAIL SALES AUDIT AND HOUSEHOLD SURVEY. U. S. Dept. Agr. Mktg. Res. Rept. 110, 63 pp., illus. December 1955.

Frozen grapefruit sections, when offered in retail stores, appeared to add to the total demand for grapefruit. During the 11-week test period, almost 1,300 cases of 24 10-ounce cans were sold. Two-thirds of the sales were made during the 4-week promotional period. During the test period, sales of frozen grapefruit sections were second only to frozen strawberries, when compared with other frozen fruits.

DOTY HARRY O., JR. DISTRIBUTION OF LAMB AND MUTTON FOR CONSUMPTION IN THE UNITED STATES. U. S. Dept. Agr., Agr. Mktg. Serv., AMS–93, 12 pp., illus. February 1956. (RMA)

In 1954, domestically produced lamb and mutton were shipped (or were otherwise available) for consumption primarily to the Middle Atlantic and Pacific regions. Together, these 2 regions took 59 percent of the total. California took 91 percent of the lamb going to the Pacific Region. The major portion distributed to New England and West South Central regions went to Massachusetts and Texas, respectively.

FRENCH, B. C., SAMMET, L. L., AND BRESSLER, R. G. ECONOMIES OF SCALE IN PEAR PACKING. The Tenth Report in a Series on Efficiency in Fruit Marketing. Calif. Agr. Expt. Sta., Giannini Foundation of Agr. Econ. Mimeog. Rept. 181, 33 pp., illus. October 1955.

Plants packing fresh pears vary widely in methods and size of operation. In planning future operations, plant managers face the problem of determining which combinations of methods and what scale of operations will be most efficient. This report is one of a series aimed at supplying this type of information. Previous reports dealt with small segments of the packing operation; this report is concerned with the entire in-plant process.

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[1] Processed reports are indicated as such. All others are printed. State publications may be obtained from the issuing agencies of the respective States.

Friedman, Joan, and Foote, Richard J. computational methods for handling systems of simultaneous equations with applications to agriculture. U. S. Dept. Agr., Agr. Handb. 94, 109 pp., illus. November 1955. (RMA)

Provides a standard method of approach for handling any problem that involves the estimation of structural coefficients for economic relationships whether they are derived from a single equation or a system of simultaneous equations.

Hillman, J. S. seasonal and inter-area shifts in the western lettuce industry. Ariz. Agr. Expt. Sta. Rept. 123, 44 pp., illus. October 1955.

Several significant shifts of three particular types have occurred in the western lettuce industry: (1) Shifts of planting and harvesting dates within specific producing districts; (2) shifts between major districts in relative amounts of lettuce shipped; and (3) shifts to new areas of production. Objective of this report is to measure graphically and statistically the nature and extent of these shifts and the resulting changes in competitive relationships between districts.

Helfinstine, Rex D. statistical supplement to economic potentials of irrigated and dryland farms in central south dakota. S. Dak. Agr. Expt. Sta. Agr. Econ. Pamphlet 67. (Agr. Res. Serv. cooperating.)

Hochstim, Esther S. teenage girls discuss their wardrobes and their attitudes toward cotton and other fibers. a preliminary summary report. U. S. Dept. Agr., Agr. Mktg. Serv., AMS–90, 10 pp. March 1956.

Cotton was the leading fiber in a number of items in teen-age girls' wardrobes. It ranked first in preference for summer skirts and dresses, winter and summer blouses, winter dresses for everyday wear, pajamas, shorts, slacks, sports jackets, and anklets. Wool was the leading fiber in winter skirts and dressup dresses, and for coats. Nylon ranked first for dress-length slips and for standout petticoats.

Kromer, George W. economic factors in marketing farmers' castorbeans. U. S. Dept. Agr. Mktg. Res. Rept. 106, 46 pp., illus. November 1955.

Under present marketing practices the castorbean farmer is more interested in growing beans with high yields per acre than beans with high oil content. There is no quick and easy method for determining the oil content of farmers' lots of castorbeans. Inasmuch as differences in economic worth between high-oil content beans and low-oil content beans vary from $8 to $33 per ton, farmers are relatively underpaid for beans with high-oil content and overpaid for those with low.

Lee, W. A. merchandising fresh mushrooms in retail stores. Pa. Agr. Expt. Sta. Progress Rept. 144, 4 pp., illus. (Agr. Mktg. Serv. cooperating.) February 1956.

Consumer demand for fresh mushrooms can be increased by using different methods of packaging and display. A supplemental display of mushrooms alongside the steaks in the meat case increased sales one-fourth compared with the usual display in the produce counter. Sales were increased nearly one-third by the introduction of a 1-pound package providing greater visibility of the mushrooms and a larger unit of sale.

Meinken, Kenneth W. the demand and price structure for wheat. U. S. Dept. Agr. Tech. Bull. 1136, 93 pp., illus. November 1955.

Describes the principal economic variables that influence utilization and prices of wheat and other economic relationships that exist within the wheat economy. Statistical analyses which may be used for analytical purposes or to study trends are summarized and detailed tables are presented to enable readers to use them in this way.

North Central Farm Management Research Committee. farmers' reaction to acreage allotments. Ky. Agr. Expt. Sta. (Agr. Res. Serv. cooperating.) A report on diverted acres.

The report shows the results of a survey of a sample of farmers in each of six States as to their reactions to the corn and wheat acreage allotments. Compliance with corn acreage allotments ranged from 15 percent in Michigan to about 67 percent in Iowa. 60 percent of those complying did so in order to be eligible for price support. Chief reason given by Ohio, Indiana, and Kentucky farmers was that their allotments were equal to or greater than the acreage of corn they had planned to plant in 1954. Next most important reason was a desire to cooperate in programs designed to help farmers. Of those who did not comply, the greater number needed the additional corn for feed. Chief reasons for complying with wheat acreage allotment (proportion varied greatly among the States) appeared to be to avoid penalty, to be eligible for price support, and allotment equal to or greater than planned acreage .

Parcher, L. A., Southern, John J., and Voelker, S. W. mineral rights management by private landowners. Great Plains Agr. Counc. Pub. 13. Okla. Agr. Expt. Sta. (Agr. Res. Serv. cooperating.)

Purpose of study was to present information and guiding principles so that individual landowners can answer for themselves such questions as: How may I lease my land to better advantage? Should I sell some of my subsurface rights? If so, how much and what rights and at what price? Should I reserve the mineral rights when I sell my land? Under what conditions should I buy land either with no mineral rights or with only part of them?

Phillips, Stanley W. north central states grain warehouse regulation. North Central Regional Pub. 68 (Kans. Agr. Expt. Sta. Bull. 375), 55 pp., (Agr. Expt. Stas. of Ill., Ind., Iowa, Kans., Mich., Minn., Mo., Nebr., N. Dak., Ohio, S. Dak., and Wis. and U. S. Dept. Agr. cooperating.) January 1956.

Survey of grain storage regulations in the North Central States indicated that, except in Ohio and Indiana where no regulation is attempted, control is accomplished by licensing systems, augmented by fidelity bonds, ware-

U. S. GOVERNMENT PRINTING OFFICE: 1956

house receipt control, periodic inventory reports and inspection of physical facilities and measurement of stocks. With certain outstanding differences, Federal regulation follows a somewhat similar pattern.

Scott, Frank S., Jr. MARKETING ASPECTS OF WESTERN CATTLE FINISHING OPERATIONS. A Western Regional Research Publication. Bull. 190. 66 pp., illus. (Nevada Agr. Expt. Sta. in cooperation with the Agr. Expt. Stas. of the Western States and the U. S. Dept. Agr.) December 1955. (RMA)

Approximately 72 percent of the 2½ million head of cattle placed on feed in the western States during 1951–52 were fed out in California and Colorado. In contrast to the Corn Belt where most of the feedlots are filled only once annually, there is considerable turnover in some of the more important western cattle feeding States. In California, the January 1953 estimate of cattle on feed represented only 31 percent of the cattle placed in feedlots in that State between September 1, 1952, and September 1, 1953. For the Western Region as a whole, most of the feedlots were small, but the majority of the cattle were finished out in a small number of large lots.

Sutherland, J. Gwyn, and Bishop, C. E. POSSIBILITIES FOR INCREASING PRODUCTION AND INCOMES ON SMALL COMMERCIAL FARMS, SOUTHERN PIEDMONT AREA, NORTH CAROLINA. N. C. Agr. Expt. Sta. Tech. Bull. 117. (Agr. Res. Serv. cooperating.)

Costs of the transition from current to optimum organizations on these farms would range from $7,000 per farm on farms that produce with family labor only, to $19,500 per farm for farms that use a combination of family and hired labor. Laying hens would provide a substantial part of the total net income. With improved production practices, a rather considerable increase in egg production in the Southern Piedmont would be profitable.

United States Agricultural Marketing Service. BEEF MARKETING MARGINS AND COSTS. U. S. Dept. Agr. Misc. Pub. 710, 35 pp., illus. February 1956.

Charges for marketing beef advanced about the same amount from the last quarter of 1954 to the last quarter of 1955 as they did in the 7 years ending in 1955—about one-fourth in each instance. The farm value of Choice grade beef averaged over 9 cents a pound lower in the last quarter of 1955 than a year earlier, whereas retail beef prices were down only about 3.5 cents a pound. This means that approximately three-fifths of the drop in farm value was absorbed by higher maketing costs.

United States Agricultural Marketing Service. FARM POPULATION—ESTIMATES FOR 1955. U. S. Dept. Agr., Agr. Mktg. Serv., AMS–80, 9 pp. December 1955.

Farm population decreased 3 million between 1950 and 1955, reducing the number of farm residents to 13.5 percent of the total population. Approximately 579,000 babies were born annually to women living on farms, and about 193,000 farm people died each year. About 1,564,000 persons left farms for nonfarm areas annually, and 597,000 persons moved from nonfarm to farm residences each year.

United States Agricultural Marketing Service. MARKETING COSTS FOR FOOD. U. S. Dept. Agr. Misc. Pub. 708, 14 pp., illus. December 1955.

Summarizes recent trends in food marketing costs and in the distribution of the consumer's food dollar.

United States Agricultural Marketing Service. MEASURING THE SUPPLY AND UTILIZATION OF FARM COMMODITIES, NEW INDEXES, 1924–54. U. S. Dept. Agr., Agr. Handb. 91, 114 pp., illus. November 1955.

Hitherto no satisfactory tool has been developed to analyze changes in supply and use of all agricultural commodities as a coordinated whole, or to relate developments in a particular group of commodities or source of supply or channel of distribution to the whole flow through time. The master index of supply-utilization and its sub-indexes, presented in this report, were designed to provide such a tool.

Whatley, Thomas J., and Atkins, Samuel W. INCREASING INCOMES THROUGH FARM ADJUSTMENTS IN THE GRENADALORING SOIL ASSOCIATION AREA OF SOUTHERN WEST TENNESSEE. Tenn. Agr. Expt. Sta. Bull. 244. (Agr. Res. Serv. cooperating.)

This report presents and evaluates alternatives to present systems of farming in this soil association area which involve chiefly production of cotton. Cotton would be retained as a cash crop, although the acreage devoted to it would be reduced. Alternative systems would be developed around cotton and either grade B dairying or the cow-calf type of beef production. Hogs would be combined wih dairying and hogs or hens or both with production of beef.

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